JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

JANUARY, 1833.

Abstract of the several acts passed at the last session of Congress relative to Patents for useful Inventions, with remarks thereon. By the Editor.

The following resolution was passed by both houses, and approved by the President, March 7, 1832.

"Resolved, by the Senate and House of Representatives of the United States of America, in Congress assembled, That the Secretary of State, out of the proceeds arising from the fees on patents for useful inventions, discoveries, and improvements, procure the necessary books, stationary, and other accommodations for recording the patents issued, and unrecorded, as well as those hereafter to be issued, and that he employ, and pay at a rate not exceeding twelve and a half cents for every hundred words, so many clerks as may be requisite, with convenient despatch, to record the same." And in a general appropriation bill, approved May 5th, fourteen thousand six hundred and twelve dollars were appropriated to defray the necessary expenses. In compliance with this resolution, a considerable number of extra clerks was appointed, and the specifications, amounting to about five thousand which had never been recorded, are all now on record, in proper books.

The universal impression appears to have been, that the patent law actually required that the specification should, in every case, be copied, and attached to the patent, and that it should also be placed on record in the department of state; under the influence of the practice of the office, and of this general impression, we had repeatedly read the first section of the act of 21st February, 1793, without perceiving,

as we think we now do, that such is not the fact. This section provides that after the proper petition has been presented to the Secretary of State, "It shall and may be lawful for the said Secretary to cause letters patent to be made out in the name of the United States, bearing test by the President of the United States, reciting the allegations and suggestions of the said petition, *and giving a short* description of the said invention or discovery, and thereupon granting," &c. "The same shall be good and available to the grantee, or grantees, by force of this act, and shall be recorded in a book, to be kept for the purpose, in the office of the Secretary of State, and delivered to the patentee, or his order." The third section provides that the person soliciting a patent "shall deliver a written description of his invention," "which description, filed by himself, and attested by two witnesses, *shall be filed* in the office of the Secretary of State, and certified copies thereof shall be competent evidence in all courts, where any matter, or thing, touching such rights shall come in question."

It is evident that what the law contemplated, was the inserting in the body of the patent a short description of the invention, and that the patent containing this description should be recorded; the practice, however, is merely to insert in the patent the title of the specification, without any description of the thing patented; and to record the description, but not the patent. We certainly think the practice better than the law, and that the latter ought to be made to conform to the former. This practice probably arose, in the first instance, from the difficulty, and often, in fact, the impossibility, of giving a short description of the thing invented; as the patentee very frequently neglects, or is not able, to give any thing of the kind, it is not possible for the office to supply this deficiency, in a specification; it has therefore in all cases been appended to the patent.

By an act of the 19th of May, the patent granted to Jethro Wood, of the state of New York, for improvements in the construction of the plough, dated September 1st, 1819, was extended for the additional term of fourteen years from its expiration in 1833.

The following is "An act for the relief of Horatio Gates Spafford." "*Be it enacted by the Senate and House of Representatives of the United States in Congress assembled*, That, in issuing letters patent in the usual form to Horatio Gates Spafford, a citizen of the United States, for his alleged discoveries in mechanical philosophy, carried into practical operation by appropriate machinery, it shall be the duty of the Secretary of State, upon application to him, within one year after the passage of this act, to file in the confidential archives of his department, and there preserve in secret, for one year, the descriptions, specifications, and drawings, illustrating the discoveries and inventions aforesaid: and the patent which shall be thus issued, shall have the same force and effect as if conformable in all respects to the provisions of the 'act to promote the progress of the useful arts, and to repeal the act heretofore made for that purpose.'" Approved July 3, 1832.

Since the passing of this act, the individual in whose favour it was enacted, has fallen a victim to the spasmodic cholera; but for this

circumstance we should have animadverted very freely upon his pretentions and claims; being in possession of the information which would have enabled us so to do, without violating any confidence, either real or implied, reposed in us. As the matter stands, our remarks on the subject will be brief, but at the same time, believing that it is intended, on the part of his executors, to take advantage of the act for the benefit of the heirs of the patentee, our duty to the public forbids our passing it over unnoticed; as, however, the Congress of the United States has, by the foregoing act, provided for the sealing of the specification for one year, we do not think it proper to describe the mode in which the patentee pretended to have accomplished his object.

The thing proposed to be done is one which has been very frequently attempted, but which has always failed; the following is an outline of it—the descent, to a certain distance, of a given weight, is to raise a greater weight, say twenty per cent. more, to the same height, in the same time; (water being the agent in the present case.) This is a somewhat startling proposition, and to *the few* who are well grounded in the principles of mechanics, will do something more than throw doubt upon the whole scheme. The great mass, who are easily deceived by the exhibition of pretended perpetual motions, or who, at least, believe that such a thing may be eventually discovered, would venture their money, in the present instance, with *as great* a probability of success, as upon any plan likely to be devised for the same purpose; for ourselves, we should be most unwilling to buy a ticket in a lottery, where we believed that all must draw blanks.

The sealing of patents either for a part or for the whole of their term, appears to be, in some cases, very desirable; still there are objections to it which cannot be easily obviated. What one man has invented or discovered, another may likewise invent or discover; and how is an applicant to know that he is not interfering with rights vested in another having a sealed patent? One of the most desirable features in the patent law is an effective caveat, which should allow time for the completion of an invention, and defend the inventor from those prowling, epicurean cannibals who are seeking to live upon the brains of their fellow men. The English have a caveat, but it is worthless; we have none, nor do we believe that there is any where an existing model by which to frame one; the object, however, we consider as of easy attainment.

In the case before us, we can perceive but one motive on the part of the applicant for wishing a sealed patent, as it was not pretended that the time asked was for the purpose of completing the invention This is manifest from the provision of the act, that "the descriptions, specifications, and drawings, illustrating the discoveries and inventions," shall be placed on file, at the time when the patent is issued. The motive is indeed set forth in the memorial of the applicant, in which he states that the passing of the act in his favour, would enable him to raise "money power;" or, in other words, would have the effect of inspiring that confidence in the validity of the invention as should induce persons to encourage the thing by investments of mo-

ney; and such is the necessary effect of the passing of such a law, the public not recollecting, or not being aware, that those who passed the law knew no more than themselves respecting the merits of the proposed invention.

An act, bearing the same date with that last noticed, was passed, directing the issuing of three patents to three foreigners: one to Thomas Knowles, of Manchester, England, for an improvement in cotton spinning; one to James Long, of Greenock, Scotland, for spinning rope yarn and duck twines; and one to William Steel, of Liverpool, England, for an atmospheric reacting steam-engine. The proper models and specifications for obtaining these patents are to be deposited in the patent office within six months from the time of passing the act; and the rights are to cease and determine if the inventions are not introduced into public use within two years, or upon their being discontinued, at any time for the space of six months.

Whilst it is very desirable that special legislation should be avoided as far as consists with justice, and congress have actually, on this principle, rejected many propositions, but these acts leave the door wide open for applications on the part of foreign non-resident inventors, and we shall find that numbers will, in consequence, seek an entrance. Comity, we think, requires that whilst Americans can obtain exclusive rights in foreign countries, foreigners, under proper regulations, should be enabled to obtain patents here; but this, if proper to be done, should be done by a general law, which should place all upon an equal footing. Among other considerations, it seems scarcely fair that whilst an American must pay fifteen hundred dollars for a patent extending over the British empire, an Englishman should obtain the same right in the United states for thirty dollars. Ought not the principle of countervailing duties to govern in this as in some other cases?

Another act, dated the same as the foregoing, entitled "an act concerning patents for useful inventions," provides in the first section for the publication, annually, in two of the newspapers printed in the city of Washington, of a list of all the patents which have expired during the preceding year, with the names of the patentees, alphabetically arranged.

The second section provides that where a patentee intends to apply to congress to prolong, or renew, the term of a patent, he shall give notice of this intention, at least once a month for three months, in two newspapers published in Washington, and in one authorized to publish the laws in the state, or territory, in which the patentee resides. The petitioner is to set forth the grounds of his application, with the evidence thereon, verified upon oath before a judge or justice of the peace; and this is to be accompanied by a statement of the ascertained value of the thing patented, and the amount of receipts and expenditures which have accrued therefrom.

The third section authorizes the Secretary of State to receive the surrender of a patent, and to grant a new patent upon an amended specification, where, from inadvertence, accident, or mistake, the original specification had been defective.

This provision is in perfect accordance with the decision of the Supreme Court, in the case of E. & H. Raymond *versus* Grant & Townsend, made previously to the passing of this act, and published in the last volume of this journal, p. 308. It is provided also that the new patent shall be liable to the same objections and defences with the original. And that "no public use or privilege of the invention so patented, derived from or after the grant of the original patent, either under any special licence of the inventor, or without the consent of the patentee, that there shall be a free public use thereof, shall in any manner prejudice his right of recovery, for any use or violation of his invention, after the grant of such new patent as aforesaid."

The last act passed in the session, and dated July 13th, is entitled "an act concerning the issuing of patents to aliens for useful discoveries and inventions." By the act of 1800, aliens who have resided for two years in the United States were allowed to obtain patents: in every session, however, special acts have been passed, enabling such as had resided here for a less period of time, to do the same thing. The present act is intended to embrace such cases, and provides that aliens who have made a legal declaration of their intention to become citizens of the United States, may also obtain patents for their inventions. Should the patentee neglect to introduce the thing patented into public use, for the space of one year after the patent has issued, or should its public use be discontinued for the space of six months, or should the patentee not become a citizen at the earliest period when he is entitled to do so, the patent is to determine, and become void, without the necessity of any legal process to annul, or cancel it.

The foregoing does not repeal the provisions of the act of 1800; those aliens, therefore, who have resided for two years within the United States, stand upon a much better footing than those in whose favour the present act was passed, the special provisos of this act not affecting the former.

There appears to be some incongruity in allowing to the non-resident foreigners, Knowles and others, two years for the introduction of their inventions, whilst those who are residents, and have declared their intention to become citizens of the United States, are restricted to one year; perhaps, however, as the former must act through agents, and reside themselves at a distance, it was thought that more time ought to be allowed to them than to residents.

We hope, at no very distant day, to see the several laws upon this subject combined in one harmonious whole, in which the rights of individuals, and those of the public, will be better defined and secured than they now are. The patent laws both of England and France, are under revision; the present advanced state of the arts, the experience which has been obtained respecting the operation of the existing laws, and the opinions and decisions of the courts, may certainly serve as guides in the attempt, and produce better results than could have been obtained under the circumstances which existed when the laws were originally enacted.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Practical Observations on the power expended in driving the machinery of a Cotton Manufactory at Lowell.

In a communication made some months since to Dr. Jones, I proposed offering for publication in the Journal of the Franklin Institute, some trials made on the quantity and power of water requisite to operate a given quantity of machinery, for the manufacture of cotton cloth.

Other engagements have prevented my preparing the article until this time. I offer it for critical examination, and shall feel grateful for the detection and correction of any errors that may be discovered, having no interest in any other than a true result.

The trials were made on one of the Hamilton mills at Lowell, in 1830. The goods manufactured were coarse cotton drillings, from yarn No. 14.

The dimensions of the mill, and the description of the mill work, gear, and machinery, are as follows:—

The building is 155 feet four inches long, by forty-four feet four inches wide, five stories high on the back, and four stories on the front side. The basement story contains the water wheels, and furnaces for warming the mill. The second story contains the carding and other machinery for preparing the cotton for spinning. The third story contains the spinning machinery; the fourth contains the weaving, and the attic story contains the warping, dressing, and drawing, ready for the weaving.

The quantity of machinery is, two willows, two picking machines, forty-three breaker, and forty-eight finisher cards, eight drawing frames, one Taunton speeder, twelve double speeders, thirty-six warp, and thirty-one filling, spinning frames, with sixty-four spindles each, is 4288 spindles; 144 looms, nine warping and twelve dressing frames.

The head and fall of water is thirteen feet.

The mill is driven by three water wheels, each thirteen feet in diameter, and fourteen feet length of buckets, equal in all to forty-two feet length of buckets.

The tops of the water wheels are on a level with the surface of the water in the feeding canal, when the canal is filled to its proper height.

The wheels are such as are denominated breast wheels.

There are three sets of gates for letting the water on to the wheels; the upper gates are one foot, the second two, and the third three feet below the tops of the wheels. The gates draw horizontally, and the water flows through mouth pieces, with openings of the length of the buckets, and three inches in width, giving the water a proper direction to strike the bottoms of the buckets.

The wheels are ventilated by small wooden spouts, passing from the bottoms of the buckets to the opposite side of the wheel, so that no air can be confined within the buckets to prevent their filling

with water. The water wheels, at working velocity, make 6.1 revolutions per minute, equal to 4.15 feet per second, velocity of the circumference of the wheels.

On the periphery of each wheel is a spur gear, composed of sixteen segments of twelve teeth each, equal to 192 teeth. This drives a spur gear with fifty-three teeth, on a horizontal shaft in the basement story, which makes 22.1 revolutions per minute.

On the same horizontal shaft, a bevel gear, with 49 teeth, drives a bevel gear with thirty-four teeth, on each of four upright shafts, which make 31.85 revolutions per minute.

A bevel gear with fifty-seven teeth on each of the uprights, drives a bevel gear with twenty-two teeth on the main drum shaft in the carding rooms.

The main drum makes 82.52 revolutions per minute.

Diameter of main drum 15 inches.

A belt from the main drum drives the card pulleys, which are $12\frac{1}{2}$ inches in diameter, and make 99.02 revolutions per minute.

A pulley, thirty inches in diameter, on the main drum shaft, drives a counter drum $16\frac{1}{4}$ inches in diameter. And a pulley $26\frac{1}{2}$ inches in diameter on the counter drum, drives the double speeder pulleys, which are $12\frac{1}{2}$ inches in diameter, and make 318.6 revolutions per minute.

A belt from a pulley twenty inches in diameter on the main drum shaft, drives a counter drum $10\frac{3}{4}$ inches in diameter. And a belt from the counter drum drives the drawing frame pulleys, which are five and a half inches in diameter, and make 300 revolutions per minute.

Two sets of picking machinery in separate buildings, are driven by a shaft geared from the horizontal shaft in the basement story. The main pulley (on this shaft) in the picker houses, is thirty-four inches in diameter, and makes 101 revolutions per minute.

A belt from the main pulley drives a drum fifteen inches in diameter; and a belt from a pulley $36\frac{1}{4}$ inches in diameter, on the same drum, drives the beater pulleys of the picker, which are seven and a half inches in diameter; and the beaters make 1107 revolutions per minute.

A belt from the fifteen inch drum drives the willow pulley, which is $12\frac{1}{4}$ inches in diameter, and makes 467 revolutions per minute.

A belt from a pulley twenty-eight inches in diameter on the main drum shaft, drives a counter drum, $16\frac{1}{2}$ inches in diameter. A belt from the counter drum drives the pulleys of the spinning frames, which are sixteen inches in diameter, and make 144.41 revolutions per minute.

In the weaving room, a bevel gear, with fifty-seven teeth on the upright shafts, drives a bevel gear with twenty-two teeth on the main drum shaft, which makes 82.52 revolutions per minute.

A belt from a pulley twenty inches in diameter on the main shaft, drives a pulley $21\frac{3}{4}$ inches in diameter on a counter drum. Diameter of counter drum $16\frac{3}{4}$ inches. A belt from this counter drum drives the loom pulleys, which are twenty-six inches in diameter, and make 48.88 revolutions per minute. One revolution of the pulley makes two strokes of the lay, that is, 97.76 strokes per minute.

A belt from a pulley twenty inches in diameter, on the main drum shaft, drives a pulley of twenty-two inches diameter on a counter drum, the diameter of which is $16\frac{1}{8}$ inches. A belt from this counter drum drives a pulley of $20\frac{1}{4}$ inches on a second counter drum. A belt from a pulley fifteen inches in diameter on the second counter drum, drives the dresser pulleys, the diameter of which is $23\frac{1}{2}$ inches, and make 53.05 revolutions per minute.

A belt from the main drum, which is $12\frac{3}{4}$ inches in diameter, drives a pulley of $16\frac{1}{4}$ inches diameter on a counter drum, which is ten inches in diameter. A belt from the counter drum drives the warper frame pulleys which are $12\frac{5}{8}$ inches in diameter, and make 50.97 revolutions per minute.

The following table shows the power of each kind, and of the whole quantity of machinery, equal to raising the given number of pounds one foot per second, as found by Mr. Colburn, by an accurate dynamometer of his invention.

TABLE FIRST.

Number of machines.	Names of machines.	Parts of machines.	Velocity per minute of parts of machines.	Power of machinery. Single.	Power of drums. Single.	Power of machinery. Total.	Power of drums. Total.	Power of machinery and drums. Total.	Total power of each room.
				lbs.	lbs.	lbs.	lbs.	lbs.	
2	Pickers and 2 willows.							2500	
43	Breaker cards.	Cyl.	96	47	12	2021	516	2537	
48	Finisher do.		96	38	12	1824	576	2400	
8	Drawing frames.			46	22	368	176	544	
12	Double speeders.	F. Roll.	144	125	64	1500	768	2268	
	Carding room.					5713	2036		10249
36	Warp spinning frames.	Flier.	3344	404	20	14544	720	15264	
31	Filling do.		2603	356	20	11036	620	11656	
	Spinning room.					25580	1340		26920
144	Looms.	Lay.	103	50	8	7200	1152		
	Weaving room.								8352
9	Warping frames.			36	21	324	189	513	
12	Dressing do.			226	12	2712	144	2856	
	Dressing room.					3036	333		3369
	Total power of machinery and drums, exclusive of the main gear,	.	.	.	.	.	.	.	48890
	Add for main gear,	.	.	.	.	.	.	.	1784
	Total power of mill,	.	.	.	.	.	.	.	50674

Experiments were made to determine the quantity of water drawn per second, to run said cotton mill for twelve days.

The water was measured by a wheel made for the purpose by Mr. John Dummer, an experienced and skilful millwright; the waste of water was prevented as far as was practicable.

The construction of the wheel and boxing was as follows:

A plank piling was set across the mill race, extending to such a depth and width through and back of the walls of the mill race, as to entirely prevent the circulation or discharge of any water, except through the opening cut for the purpose. Into this opening was fitted a tight plank boxing, extending to the width of the mill race (fifteen feet in the clear,) and ten or twelve feet in length of the mill race.

The bottom planking of the boxing was cut to such a curve as to fit to the wheel, so that one float board should not leave the curve till another had entered.

The wheel was first made in the form of a large drum, fifteen feet long, and twelve feet three inches in diameter outside of the planking. Sixteen sets of arms were then framed and bolted into the wheel, to which were attached the float boards, which were of hard pine, unseasoned, a little over an inch thick, and three feet six inches in depth, making the whole diameter to the extremities of the float boards, nineteen feet three inches.

The edges and ends of the float boards were fitted as close to the boxing as they could be, to move without friction.

The gauge of the wheel at one revolution, deducting the space occupied by the arms and float board, was 2500 cubic feet.

To one of the gudgeons of the wheel was attached a clockwork movement with three indexes, to point out the number of revolutions made in any given time.

During the whole time occupied in the trials, the height of the back water in the mill race was so regulated as to cover the full depth of the float boards, so that the wheel could not revolve without completely filling the wheel with the water discharged from the water wheels of the mill.

The gauging wheel was set so low that this could be done without setting the back water on to the water wheels, so that no obstruction was presented to them on that account.

The table which next follows contains the details of the measurement of the heads of water, and opening of the gates at the different hours during twelve days; the sums of the numbers thus obtained, with the average taken from them, the whole time of observation, the number of revolutions of the wheel, with other particulars, are given in the third table.

TABLE SECOND.—PART FIRST.

THREE WATER WHEELS. *Total length of bucket* (3×14) 42 *feet. Opening of upper and 2nd gates the same.*

Days of the week.	Days of the month.	Hours of the day.	Head on the upper gates.	Head on the second gates.	Opening of each gate.	Days of the week.	Days of the month.	Hours of the day.	Head on the upper gates.	Head on the second gates.	Opening of each gate.	Days of the week.	Days of the month.	Hours of the day.	Head on the upper gates.	Head on the second gates.	Opening of each gate.
		H. M.	In's.	In's.	In's.			H. M.	In's.	In's.	In's.			H. M.	In's.	In's.	In's.
Wednesday.	13	8	10.38	22.38	2.70	Friday.	15	7	13.00	25.00	2.40	Monday.	18	8	17.38	29.38	2.47
		9	10.00	22.00	2.68			8	18.12	30.12	2.33			9	12.62	24.62	2.62
		10	9.25	21.25	2.64			9	12.00	24.00	2.53			10	12.38	24.38	2.62
		11	7.25	19.25	2.58			11	11.63	23.63	2.55			11	12.63	24.63	2.50
		12	5.75	17.75	2.79			12	11.75	23.75	2.61			12	11.75	23.75	2.52
		1	11.25	23.25	2.60			2	11.75	23.75	2.68			1	19.25	31.25	2.25
		2	6.00	18.00	3·00			3	12.12	24.12	2.53			2	13.50	25.50	2.48
		3	5.25	17.25	2.98			4	12.75	24.75	2.52			3	11.62	23.62	2.52
		4	4.75	16.75	3.00			5	12.50	24.50	2.45			4	11.12	23.12	2.58
		5	5.50	17.50	2.90									5	11.62	23.62	2.50
Thursday.	14	8	10.38	22.38	2.63	Saturday.	16	7	17.50	29.50	2.18	Tuesday.	19	8	20.00	32.00	2.20
		9	9.75	21.75	2.61			8	17.50	29.50	2.18			9	11.75	23.75	2.55
		10	9.38	21.38	2.82			9	13.75	25.75	2.44			10	10.75	22.75	2.64
		12	8.88	20.88	2.68			10	12.63	24.63	2.60			11	11.12	23.12	2.51
		1	13.63	25.63	2.32			11	14.37	26.37	2.32			12	11.12	23.12	2.48
		2	9.87	21.87	2.62			12	14.00	26.00	2.45			1	19.63	31.63	2.51
		3	9.75	21.75	2.54			2	14.38	26.38	2.40			2	12.12	24.12	2.45
		4	9.37	21.37	2.54			3	14.75	26.75	2.41			3	12.12	24.12	2.42
		5	9.00	21.00	2.65			4	17.62	29.62	2.58			4	14.25	26.25	2.60
								5	19.25	31.25	2.20			5	10.75	22.75	2.61

TABLE SECOND.—PART SECOND.

THREE WATER WHEELS.—*Total length of bucket* (3×14) 42 *feet. Opening of upper and 2nd gates the same.*

Days of the week.	Days of the month.	Hours of the day. H. M.	Head on the upper gates. In's.	Head on the second gates. In's.	Opening of each gate. In's.
Wednesday.	20	8	17.25	29.25	2.63
		9	11.37	23.37	2.57
		10	11.00	23.00	2.57
		11	9.63	21.63	2.52
		12	9.62	21.62	2.61
		2	12.00	24.00	2.36
		3	10.75	22.75	2.46
		4	10.75	22.75	2.66
		5	11.38	23.38	2.59
Thursday.	21	8	16.75	28.75	2.06
		9	11.50	23.50	2.54
		10	11.50	23.50	2.44
		11	11.38	23.38	2.51
		12	12.12	24.12	2.35
		1	20.12	32.12	2.30
		2	15.12	27.12	2.43
		3	11.63	23.63	2.58
		4	9.88	21.88	2.54
		5	11.00	23.00	2.36
Friday.	22	8	19.75	31.75	2.00
		9	11.12	23.12	2.53
		10	8.75	20.75	2.69
		11	8.75	20.75	2.64
		12	10.00	22.00	2.44
		1	13.50	25.50	2.42
		2	12.13	24.13	2.30
		3	11.75	23.75	2.50
		4	11.75	23.75	2.35
		5	12.50	24.50	2.38
Saturday.	23	7	12.12	24.12	2.20
		8 30	13.38	25.38	2.40
		9	12.62	24.62	2.43
		10	12.13	24.13	2.39
		11	12.00	24.00	2.50
		12	12.00	24.00	2.36
		1	22.37	34.27	2.48
		2	13.88	25.88	2.32
		3	13.37	25.37	2.26
		4	17.00	29.00	2.90
		5	18.88	30.88	2.69
Thursday.	28	7	11.50	23.50	2.33
		8	16.12	28.12	2.30
		9	11.25	23.25	2.45
		10	10.25	22.25	2.56
		11	10.25	22.25	2.42
		12	11.50	23.50	2.28
		1	17.25	29.25	2.20
		2	12.63	24.63	2.35
		3	11.62	23.62	2.20
		4	11.25	23.25	2.52
		5	13.00	25.00	2.19
Friday.	29	7	12.50	24.50	2.40
		8	19.25	31.25	2.00
		9	11.25	23.25	2.41
		10	11.63	23.63	2.56
		11	10.37	22.37	2.42
		12	10.63	22.63	2·45
		1	15.62	27.62	2.35
		2	11.00	23.00	2.42
		3	11.00	23.00	2.44
		4	11.25	23.25	2.46
		5	11.88	23.88	2.40

Table Third.

Aggregate results of table second, with other quantities and deductions.

Days of the week.	Days of the month.	Aggregate of observed heads for upper gates.	Aggregate of observed heads for second gates.	Aggregate of openings of each gate.	Whole time through each day.			Revolutions of gauging wheel through the day.	Total discharge of water each day.	Discharge per second.	Average head on upper gates.	Average head on second gates.	Average opening of each set of gates.	Area of opening of gates.	Theoretical discharge through upper gates.	Theoretical discharge through second gates.	Total theoretical discharge.	Proportion of actual discharge to	theoretical discharge.
		In's.	In's.	In's.	H.	M.	S.		Cubic ft.	Cub.ft.	In's.	In's.	In's.	sq. ft.	Cub.ft.	Cub.ft.	Cubic.t.		
Wednesday.	13	75.38	195.38	27.87	12	22	20	1713	4282500	96.15	7.54	19.54	2.79	9.76	51.56	83.12	134.68	.71391	1.00000
Thursday.	14	90.01	198.01	23.41	12	30	57	1643	4107500	91.16	10.00	22.00	2.60	9.10	55.52	82.35	137.87	.66120	1.00000
Friday.	15	115.62	223.62	22.60	12	21	45	1670	4175000	93.80	12.85	24.85	2.51	8.79	60.58	84.49	145.07	.64659	1.00000
Saturday.	16	155.75	275.75	23.76	10	5	3	1220	3050000	84.01	15.58	27.58	2.38	8.33	63.31	84.27	147.58	.56925	1.00000
Monday.	18	133.87	253.87	25.06	12	17	24	1570	3925000	88.71	13.39	28.39	2.51	8.79	61.76	85.41	147.17	.60270	1.00000
Tuesday.	19	133.61	253.61	24.97	12	21	30	1560	3900000	87.66	13.36	25.36	2.50	8.75	61.76	84.97	146.73	.59742	1.00000
Wednesday.	20	103.75	211.75	22.97	12	29	0	1590	3975000	88.41	11.53	23.53	2.28	7.98	52.20	74.61	126.81	.69009	1.00000
Thursday.	21	131.00	251.00	24.11	12	29	57	1667	4167500	92.62	13.10	25.10	2.41	8.43	58.66	81.28	139.94	.66185	1.00000
Friday.	22	120.00	240.00	24.25	12	23	50	1520	3800000	85.14	12.00	24.00	2.43	8.50	56.81	80.34	137.15	.62078	1.00000
Saturday.	23	159.75	291.75	22.93	10	24	25	1190	2975000	79.41	14.52	26.52	2.08	7.28	53.51	72.28	125.79	.63129	1.00000
Thursday.	28	136.62	268.62	25.80	12	5	50	1550	3875000	88.98	12.42	24.42	2.35	8.22	56.10	78.47	134.57	.66122	1.00000
Friday.	29	136.38	268.38	26.31	12	14	30	1558	3895000	88.38	12.39	24.39	2.39	8.36	56.76	79.63	136.39	.64799	1.00000
																	Sum,	7.70429	

From the foregoing table it appears that the average discharge per second for the twelve days was 88.70 cubic feet. And the average ratio of actual to theoretical discharge .64202.

The cause of the difference in the openings of the gates, the quantity of water required, &c. on Saturday, compared with the other days of the week, is, that it is customary, on that day, and more particularly in the afternoon, to clean all the machinery, in consequence of which, a small part of it only is in operation at any time.

Another set of experiments was made to determine the relative powers of each room in the mill, by the quantity of water requisite to drive the machinery in it for a given time; and such portions of the machinery were taken as could be kept constantly running during the experiments, and were as follows:—

The machinery in both picking houses; 43 breaker, and 48 finisher cards; eight drawing frames; 12 double speeders, in the carding room; 34 warp, and 26 filling, spinning frames, 3840 spindles, in the spinning room; 130 looms in the weaving room; eight warping, and 12 dressing frames, in the dressing room.

1st Exp't. Main gear and drums alone.	589 sec	.3 rev's.	=7500 cub. ft.	=12.73ft per sec.
2nd Exp't. do and Carding room.	401	4	=10000	=24.94
3d Exp't. do. and spinning room.	415	10	=25000	=60.24
4th Exp't. do. and weaving room.	441	4	=10000	=22.68
5th Exp't. do. and dressing room.	563	4	=10000	=17.76
6th Exp't. the whole mill & gear.	519	20	=50000	=96.34

Now, deducting the power of the main gear and drums from each room, we have,

Main gear and drums,	- -	12.73
Carding room,	- - 24.94 — 12.73	= 12.21
Spinning room,	- - 60.24 — 12.73	= 47.51
Weaving room,	- - 22.68 — 12.73	= 9.95
Dressing room,	- - 17.76 — 12.73	= 5.03
Making the total quantity per second	- -	87.43 cub. ft.

The sum of the parts, therefore, fall short of the whole by 96.34—87.43 = 8.91 cubic feet per second.

This I account for by the difference of friction produced on the main gear and drums between running light, and their being partially, or fully loaded.

Another set of experiments was made with three rooms on, and one off at a time, alternately.

1st Exp't. Carding room off, run	357 secds.	11 rev's.	= 27500 ft.	= 77.03 — 12.73	= 64.30 per second.
2nd Exp't. Spinning room off,	486	8	= 20000	= 41.15 — 12.73	= 28.42
3d. Exp't. Weaving room off,	435	15	= 37500	= 86.21 — 12.73	= 73.48
4th. Exp't. Dressing room off,	448	16	= 40000	= 89.28 — 12.73	= 76.55
					242.75

242.75 ÷ 3 = 80.92 and 80.92 + 12.73 = 93.65 cubic feet per second, the sum of all the parts.

5th Experiment, the whole mill on, run 533 secds, 20 rev's. = 50000 = 93.81 cubic feet per second. Making between the last of each set of experiments a difference of 96.34 — 93.81 = 2.53 cubic feet per second, with all the circumstances apparently the same. This difference I cannot readily account for, unless it so happened that the picking machinery was on the first time, and, by mistake, left off in the last, which is a circumstance that cannot now be ascertained.

The proportional power, by the last set of experiments, will be

Main gear and drums,	- - -	12.73
Carding room,	- -	80.92—64.30=16.62
Spinning room,	- -	80.92—28.42=52.50
Weaving room,	-	80.92—73.48= 7.44
Dressing room,	- -	80.92—76.55= 4.37
		93.66

Comparison of the several results.

	Proportional power by the dynamometer.	Proportional power with one room only, on at a time.	Proportional power with one room only, off at a time.	Mean proportional power.
Main gear and drums,	.14816	.14561	.13592	.14323
Machinery in carding room,	.12738	.13967	.17745	.14817
Do. spinning room,	.51264	.54340	.56054	.53886
Do. weaving room,	.14493	.11380	.07943	.11272
Do. dressing room,	.06689	.05752	.04666	.05702
	1.00000	1.00000	1.00000	1.00000

In this comparison, I suppose the discrepancy to arise from the difference of friction on the water wheels and main gear, which was not sufficiently experimented upon to be nicely determined.

In experiment No. 6, on the opposite page, the effect produced by the water acting to drive the machinery and gear, was 47350 lbs. the quantity of water expended per second 96.34 cubic feet. The head above the bottom of the wheel, thirteen feet. Now 96.34 × 62½ ×

13=78276 lbs. the power. And 47350 ÷ 78276 = .6049 is the ratio of effect to power expended, power being 1.

All, or any abridgment of the foregoing, as may be found most desirable, is offered for publication to the Franklin Institute of Pennsylvania,

By their very obedient and humble servant,

ITHAMAR A. BEARD.

Note.—On the 129th page, vol. ix. Journal Franklin Institute, I find a notice of a patent granted to Joseph E. Eldred, of Rochester, New York, for an instrument for plumbing and leveling.

This I consider as no new invention, nor so much as a new application of an old principle. I made one of almost exactly similar dimensions and construction as the one described by Mr. Eldred, which I have had in constant use for more than five years, and several of my friends have them in use, patterned after mine.

It is a very convenient instrument for plumbing, and much more accurate than the old mode with a line and bob, and so far as I am concerned, is free for the use of any one who may wish to adopt it.

FRANKLIN INSTITUTE.

Explosions of Steam Boilers.

(Continued from p. 232, vol. x.)

(No. XXX.)

The committee on explosions are indebted to General Charles Gratiot, Chief of the corps of engineers of the United States, for the following communication, which contains a description of the project of James O. Blair, of Louisiana, for securing boilers from explosions. The drawings were lithographed, and the description was drawn up in the engineer department from documents furnished by the inventor.

The first of these drawings is omitted as showing the same defect with that pointed out in the communication of Cadwalader Evans, in the 9th volume of this Journal. Reference may be made to that drawing (p. 91, vol. ix.) in reading the following description, which applies to the first figure of the lithographic drawing.

COMMITTEE ON EXPLOSIONS.

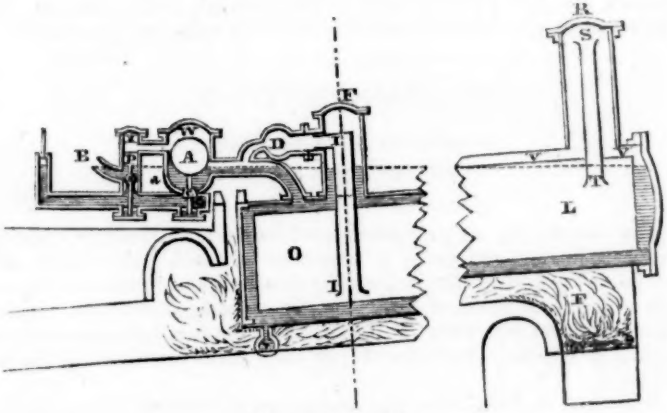
Defect of Connected Boilers.

A transverse section of the six contiguous boilers, of the steam engine used commonly on the western waters, shows that when the boat careens, or leans to one side, a portion of the flue of each boiler on the higher side is exposed to the action of the fire without being protected by water. When the boat resumes its level, the water is thrown into the heated boilers, and a rapid production of steam takes place. Six flues, of fourteen inches diameter, and thus situated, will, if the boilers be twenty feet in length, expose for a careening

in the highest boiler of six inches, to the direct action of the fire, about 140 feet of surface, and the sides of the boilers about thirty feet more, in all 170 feet, the weight of which would be, the iron being taken as one-fourth of an inch in thickness, about 1600 lbs. This at a temperature of 1075° Fah. or a heat which would appear red in the dark, would transform into steam more than ten pounds of water, or its equivalent, one and a fourth gallons, which would be equal to 2125 gallons of steam at a temperature of 350°, or equal to a pressure of more than 120 lbs. to the superficial inch.

The drawing represents six three feet boilers, which are less than the common size for steam-boats of the larger class; consequently, the exposed surface herein shown, is less than it would be in a larger set of boilers with the same angle of careen to which they daily, if not hourly, are exposed, particularly in long voyages.

Fig. 2.



Proposed Remedy.

Fig. 2 represents a longitudinal section through the middle of the centre boiler and hydrostat. The rear end of the boiler is depressed below the front half its diameter, for which reason the back end of the boiler, and for some distance towards the furnace is filled with water as represented by the dotted line P T. The part marked V V shows where the steam is first generated, S T the pipe by which it passes into the steam chest O L, I I is the pipe by which it passes out again into the transverse supply pipe D, which charges the engine.

From this pipe, D, is a communication with the *hydrostat*, or the governor of the quantity of water requisite for the supply of the boilers. This hydrostat is placed on the top of the first boiler, seen in fig. 3. The boilers being full, the surplus water, by the superincumbent pressure of the steam, opens the valve C attached to the buoy A,

through which it passes, and up through the valve *a*, into the waste pipe which conveys it off at the point B. But the moment the pressure of the steam in the boilers has wasted water enough to produce equilibrium, the valve C (below buoy A) being still open, the water passes through the opening of that valve into the boilers, without acting on the piston P, and so on alternately. P is the piston on which the steam rests at X, with all its force, and on which the water only begins to exert an upward force when it becomes too high in the boilers for safety; when this is the case, the piston P, with its valve (*a*) is lifted, and the surplus water escapes at B.

It is important to recollect that it is the *difference* of pressure on the top and bottom of the piston P that causes it to close after it is opened by the action of the water forced by the pump. Those that have been in operation have been proportioned as follows, viz. the lower valve, *a*, has been two inches in diameter, while the valve of the piston P itself was three inches. The square of three being nine, and the square of two being four, the ratio of the pressures will be as nine is to four; hence the piston being acted upon by 900 pounds, and the valve *a* by only 400, the column of water in the waste pipe is cut off by the pressure on the piston the moment the pump ceases to act on the water.

Fig. 3.

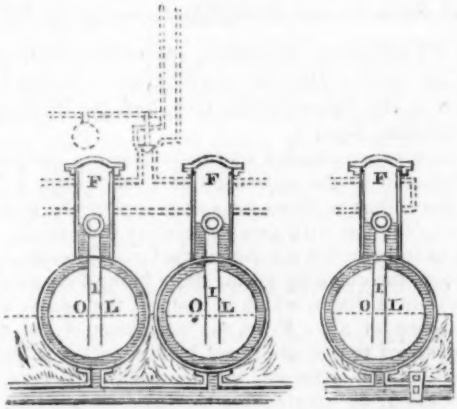


Fig. 3 represents a transverse section of seven* boilers, on the centre one of which the hydrostat is placed. As the fire of the furnace never rises higher than the centre of the boilers, represented by the dotted line O L, O L, &c. it is evident, if the boilers were three feet in diameter, that the boat would have to careen to one side three feet before the water could sink on the higher side of the boat down to

* Only the centre boiler, that next to it, and the extreme boiler, are shown in the cut.—Com. Pub.

the fire line, even if there were any place for the water to run to; but the back end of the boilers being full, the water could only run out of the pipes on the high side, and rise in the same ratio on the lower side; consequently the water could never come down to the fire line.

By a reference to figure 2, it will be seen that the steam is taken into the steam chest at the high or furnace end of the boilers, that this end being below the other end half a diameter, will force the steam to run along the top of the boilers V V on the inside, as fast as it is generated, until it arrives at the nozzle R, in which there is a steam pipe S T, which conducts it into the steam chest O L. At the other end of the boiler, will be seen another nozzle, F, in which the water and steam rise, and from which the steam is taken at D, for charging the engine. This arrangement is important, since, without it, a portion of the water would be drawn over with the steam, and thus injure the working of the engine. These facts have been deduced from experience.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JUNE, 1832.

With Remarks and Exemplifications, by the Editor.

1. For a *Ventilating Machine*, intended either to introduce or displace air, with a view to purification; George Harley, and John Sedgwick, the former of the city, and the latter of the county of Philadelphia, June 1.

This machine is constructed like those blowing machines in which a blast is produced by the revolution of a fan within a drum or cylinder; but the patent is taken for a new application of this machine, and for moving the fan with greater velocity than usual. The fan is constructed exactly in the manner of that most commonly employed in the machines for cleaning grain, there being four vanes revolving on an axis within a drum, which is open at the centre of each head for the admission of air. From the periphery of the drum a tube extends to conduct the air produced by the motion of the fan to any place desired, as, for example, into the hold of a vessel which requires ventillation: by lengthening the tube, we are told that the air may be conveyed to any distance. This, however, is a mistake, as an early limit will be found, the force of the blast decreasing rapidly with the length of the tube.

When it is wished to diffuse the air around the point of delivery, a hollow globe of metal is placed upon the end of the tube, through this ball there is a number of perforations with short tubes radiating from them.

To give a rapid motion to the fan, a wheel is turned by means of a crank, and a band from this wheel passes round a whirl on an axis crossing the bottom of the frame work of the machinery; from a larger

whirl or drum on this axis another band passes round a small whirl on the axis of the fan.

As there is but little novelty in this machinery, it presents but little upon which the patentees could found a claim. The points chosen are the accelerated motion given to the fan; the using the machine for ventilating, and the addition of the copper ball, when required.

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2. For an improvement in the *Saw Mill;* Levi Chapin, Walpole, Chester county, New Hampshire, June 1.

A patent was obtained by Mr. Chapin, for an improvement in saw mills on the 13th of October, 1829, which we have described at p. 30, vol. v. The present is obtained for a still further improvement, the main features of the former being still retained. Instead of straining his saws in a frame, he uses two vibrating beams, the ends of which are segments of curves, of which the fulcrum of the beam is the centre. Straps, or chains, passing around these curved ends, have blocks at their extremities to which the saws are fastened. By means of one beam above, and another below the saws, two of them are strained, and kept parallel to each other. The principal subject of the present patent is the mode in which the beams carrying the saws are made to vibrate by an apparatus which is used as a substitute for the crank. A shaft crosses the frame work of the mill exactly above the upper vibrating beam; the middle part of this shaft is made cylindrical, and from this part fillets project like the square thread of a screw, and pass spirally round a portion of its circumference; a second fillet, similar to the first, and parallel to it, completing the circuit. Upon the upper side of the vibrating beam, projecting pieces are fixed which take on to the fillets, and these, as they revolve, communicate a vibratory motion to the beam by the alternate engagement and disengagement of the two fillets. The principle is in fact the same as that of the cylinder with diagonal grooves, which has frequently been used to produce a reciprocating motion in machinery.

We think this plan very inferior to the ordinary crank motion, for although it produces a similar effect, it is at a greater expense of friction.

The patentee claims, "*particularly*, the cam motion for driving the saws; and the methods described for regulating the saws and the carriages, &c., as well as the manner of communicating motion from a crank to the saw beam through means of a pitman." This latter clause of the claim seems to abandon that part which was *particularly* claimed, and sends us back to the crank by which this kind of motion is usually produced.

---

3. For an improvement in the mode of *Manufacturing Cow and Sheep Bells*, and in brazing and bronzing the same; Samuel Booth, Berlin, Hartford county, Connecticut, June 1.

The bells are to be of the usual form, but instead of cutting them out in one piece, by which a great waste of metal is occasioned, the

sides are to be cut in separate pieces, which are to be rivetted together, and then brazed.

Instead of brazing and bronzing them in a smith's forge, nests of them are to be placed in an air furnace, in which anthracite or other fuel may be used. They are thus brazed more economically than in the former mode.

The claims are to the mode of cutting out the sheet iron in two pieces, taking the top and bottom pieces alternately, and rivetting the tops together; also the mode of brazing and bronzing in an air furnace.

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4. For a *Machine for cleaning and dusting Rags for making Paper;* Samuel E. Foster, Brattleboro, Windham county, Vermont, June 1.

Around a shaft of about two feet in length, arms are set spirally, so that in revolving they shall describe a circle of about three feet in diameter. Any number of these are to be placed side by side, and below each of them there is to be a curved bed of wove wire, through which particles of foreign matter may fall into a box below. There is a casing over the entire row of revolving cleaners, and at the end where the rags are admitted a revolving blower, or fan, forces wind through the whole apparatus. A velocity of three hundred revolutions in a minute is to be given to the cleaners; the rags are introduced from the cutting machine, are thrown from one revolving cleaner to the other, throughout the whole range, and the dust is eventually blown out through a trunk leading out of the building. The claim is to the revolving shafts and arms, placed over wire cloth, with the addition of the blower, as described, for the purpose of cleaning and dusting rags.

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5. For a *Churn;* Jeremiah Darrow, Warren, Trumbull county, Ohio, June 2.

The mode of giving a vibratory motion to the dasher of this churn is the thing for which a patent is claimed. A vertical shaft carries the dasher within the churn; upon the top of this shaft, and above the lid of the churn, there is a whirl, round which a rope passes, and this being drawn alternately by its two ends, produces the action desired The ends of the rope are attached to a vertical wheel standing above the churn, which being moved by hand, draws the rope backwarks and forwards.

There are a number of particulars noted by the patentee, which are probably esteemed by him to be points of great importance, but as the whole churn is no better than a thousand others, we shall not detain our readers by particularizing them.

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6. For a machine for *Mixing Clay and Mortar;* Jesse Chapman, Mad River township, Champaign county, Ohio, June 2.

A screen, and a mixing apparatus, are both enclosed in a box, and made to revolve by a winch, and suitable gearing. The screen is

covered with wire, and placed a little inclined in the usual manner of revolving screens. The sand and lime to be mixed are put into a hopper leading into the upper end of the screen; the finer particles pass through the meshes, and the stones fall out at the lower end, which projects through the box.

The mixing shafts, which are below the screen, have pins projecting from, and set spirally around them so as to pass between, and not interfere with, each other. These, by their revolution, incorporate the sand and lime: water, of course, must be supplied, although this is not mentioned in the specification. When clay is to be mixed, the screen will not be required. A door opens at the lower part of the box for the escape of the mortar when sufficiently worked.

The claim is to "the before described machine for mixing clay and mortar; particularly the shafts with the spirally set cutters or mixers, placed obliquely, and in contrary directions; also the revolving screen for screening lime and sand, and the moveable bottom of the hopper."

Revolving shafts, with spirally set cutters, are common in potteries, and we apprehend that any one is free to use an article so well known as a revolving screen, even for the purpose of screening lime and sand; it seems to us that the proper claim, if any is proper, would have been to the particular arrangement or combination of the parts.

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7. For a *Composition, or Paint, to render silk, linen, cotton, and woollen, water proof;* Elijah Winslow, Thomas Chandler, and John Milliken, of Unity, Waldo county, and Hezekiah Winslow, of Dixmont, Penobscot county, Maine, June 4.

We have been frequently at a loss to discover in what way a number of persons can become the conjoint inventors, or discoverers, of one individual fact, or process; and the difficulty is not lessened when it so happens that the invention, or discovery, is one which has been long and extensively known. In the case before us both of these circumstances concur in placing us in a quandary.

The recipe given instructs us to take about eight ounces of gum elastic, to about one gallon of linseed oil, with any dryer which may be preferred, and to boil the whole until the gum is dissolved. After such colouring matter as may suit the purpose has been added to the fluid, the composition, or paint, is fit for use.

The claim is to this method of dissolving gum elastic, for the purpose designated.

We could supply many like recipes, not of our own invention, by which a similar composition may be produced, the main article employed, the caoutchouc, having been tortured in almost every way for the purpose of using it in paint, or varnish.

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8. For a *Grist Mill;* Seaver N. Prentiss, city of New York, June 4.

A weighted lever presses upon the top stone, in order to prevent

it rising. The mode of applying the weight differs from those which have preceded it, but the end attained is the same. The object in view is to grind with stones of from twenty to twenty-four inches in diameter, giving them that force by pressure which they cannot derive from their own weight, and that velocity which shall compensate for their diminished diameter. The claim is to certain particular arrangements, and especially to the manner of weighting.

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9. For a *Grist Mill;* Asael Baron, Windsor, Broome county, New York, June 4.

This is another patent for another mode of keeping the spindle from rising in a portable grist mill. The top of the spindle passes into an iron box affixed to the bridge tree; the box is so contrived as to be readily supplied with, and to retain, the oil necessary to keep the parts lubricated; the construction and other arrangements of the machinery are the same as is usual in such mills.

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10. For an improvement in the *Mode of letting Water on Horizontal Wheels for Mills;* Asael Baron, Windsor, Broome county, New York, June 4.

A horizontal wheel, with radiating buckets, and enclosed in a penstock, is to have the water admitted upon it on opposite points on its upper side, and, of course, in opposite directions; it is likewise to be carried off through two openings constructed for the purpose. When used in a stream, or current, the water is to be admitted through one flood gate only. The whole affair appears to be of a very unpromising character, and we are inclined to believe it will never establish a good one by its performance.

---

11. For a *Machine for cutting and heading Nails;* Emerald Mason, Milton, Chittenden county, Vermont, June 6.

In this machine, a nail plate of any length is to be entered between rollers, and by these it is carried forward to the cutters, without being either turned or vibrated, as is usually done, for the purpose of cutting one nail out of the other. A revolving cylinder, in front of these rollers, carries two moveable cutters placed on opposite sides of it; these stand out from the cylinder to a distance equal to that of the width of the nail, the angles which their cutting edges form with it being in directions the reverse of each other. The bed cutter, which in nail machines in general is stationary, is made to vibrate upon a pin passing through the centre of its face, and thus to adapt itself to the reversed directions of the revolving cutters.

The nails as they are cut drop into the spaces between the projections on a kind of cog wheel prepared to receive them, and they are there griped in a way calculated to hold them firmly, and are headed by apparatus operating on either face of the wheel, the heading dies being forced up by toggle joints.

The claim is to "the application of a revolving circular cutter to the cutting of nails, and that so arranged as to cut them without turn-

ing the plate; the application of the feeding rollers; the receiving and holding the nail after being cut, between the cogs of wheels; the application of the lever power, as described, to the heading of the same when so held, and the unparalleled speed with which they are made."

With the exception of the latter, the form in which the claims are made appears to be good, the only question being upon their originality. We do not know whether any one has heretofore succeeded in cutting nails by revolving cutters, but we saw it tried more than twenty years ago. The machinery, however, was not well made, and was much too weak to accomplish its object. An unsuccessful trial, however, is not to militate against one that is successful, neither justice or law admit of this. Should the machine of the present patentee answer as well as he anticipates, it will be one of great value, but still its "unparalleled speed" will be no more the subject of a patent than was the unparalleled speed of Childers or Eclipse.

The patentee says, "It is also *expected* that nails of ordinary sizes may be made at the rate of three hundred to seven hundred per minute."

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12. For a *Steam Engine for raising water;* David Colver, Deer Creek, Madison county, Ohio, June 6.

Were Captain Savary alive, but, alas! he has been dead more than a century, he would smile to see how much the steam engine had degenerated in modern times. He, it is true, invented one for raising water, acting upon the same principle with that now presented to us, but very far superior to it, yet his was superseded by Newcomen's atmospheric engine, and Savary joined in the concern, abandoning his own machine, and little dreaming that its ghost would appear upon the earth after a lapse of ages.

We shall not describe the present machine, but merely repeat the observation, that it resembles Savary's, but is more *simple.*

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13. For a *Pulp Dresser,* to be used in separating the knots, knobs, or grosser particles, in the manufacture of paper: Coleman Sellers, city of Philadelphia, June 6.

(See specification, page 401 of the last volume.)

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14. For a *Figure Lathe;* David H. Mason, city of Philadelphia, June 7.

This is a complex instrument of which we intend hereafter to obtain a drawing, and procure a plate to be engraved; until then we shall not attempt a description of it.

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15. For a *Taylor's Square,* for delineating garments; Andrew Wiswell, Exeter, Rockingham county, New Hampshire, June 7.

A common square, having a long and a short arm, has divisions upon it, which bearing a certain relationship to the breast measure, is to be a complete guide in delineating garments, and to supersede all the more complex instruments which have been contrived for that

purpose. Those who are curious to learn the particulars respecting it, are referred to the patentee, who will sell them a square, and describe its use, better than we can.

16. For a machine for *Cutting Wheel Spoke Tenons;* James Smith, Fayette, Kennebeck county, Maine, June 7.

The main part of this machine is a revolving wheel, which has a groove in the middle of its periphery to receive the tenon of the spoke as it is cut. The rim is thus divided into two faces, upon each of which there are cutters operating like plane irons, and adjustible by screws, and these by the revolution of the wheel cut the tenon. The auxiliary parts consist of the gearing for giving motion to the main wheel, and apparatus to serve as guides for the spokes.

We apprehend that some of the machines previously patented for the same object will not be thrown by for the purpose of adopting the one above described.

17. For a *Churn;* William Lewis, Ashford, Windham county, Connecticut, June 7.

From the land of steady habits we have frequently some very good things, and occasionally some very queer notions; the present contribution we place in the latter class.

A pendulum is to be suspended in a frame, and by vibrating this pendulum the dasher is to be moved up and down. To help the pendulum in its labours, it is, at the end of each vibration, to strike against a spring; or rather springs upon its rod are to strike against a part of the frame work.

Whether or not the patentee adjusts his pendulum so that its vibration shall be made in the time best adapted to the rapidity of the stroke in churning, or how far he has carried his speculations respecting the varying resistance as the butter "comes," and what provision he may have made for changing the centre of oscillation, we are not informed, but due attention has undoubtedly been paid to this part of the subject, in his experimental investigations.

18. For a *Cooking Apparatus,* called "Day's economical furnace, oven, and boiler; Samuel D. and William T. Day, Westfield, Hampden county, Massachusetts, June 8.

A round furnace made of metal, or clay, contains the fuel, and over this furnace, boiling, and other operations, may be performed. There are openings at one side of the furnace, consisting of round holes, or else grate bars, against which is put what the patentees call a tunnel: this is an oven of a particular form in which roasting, baking, &c. are to be carried on. There is no claim made, nor are the superior advantages of the apparatus manifest to us either from the drawing or description, although each of them has been prepared with much care.

19. For a *Mill for grinding, scouring, and hulling Grain;*

Dan. Parmele, and Jonathan Morris, New Troy, Luzerne county, Pennsylvania, June 12.

This is another addition to the list of economical grist mills, which we shall dismiss after giving the claims of the patentees, which are to "the length of the upper spindle; the balancing the upper stone upon a collar of metal, with a round shoulder, made to vary in length in proportion to the thickness of the stone; the manner of running the under stone, and of sweeping out the flour."

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20. For a *Machine for Propelling Thrashing Machines and other machinery*, by horses or other animal power; Thomas D. Burrall, and Jehiel F. Axtell, Geneva, Ontario county, New York, June 13.

This machine for propelling machinery which is itself to be propelled by horse power, is to have a sweep ten feet long, to which the horse is to be geared; on the shaft is a cog wheel to drive a pinion on another shaft, which also has a cog wheel taking into a pinion on a band wheel shaft. These various gearings are to give great velocity, and are well contrived to consume a large portion of power by friction. Among the other grand improvements claimed is "the peculiarly simple, strong, and useful construction and combination of the frame of the horse power machine," which is constructed exactly like a thousand other frames.

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21. For an improvement in the *Tin Kitchen;* George Richardson, South Reading, Middlesex county, Massachusetts, June 14.

This, we are informed, is made like the ordinary tin kitchen, excepting that it is nearly of a square form, with the sides, bottom and back, in entire pieces, to exclude the external air; there, however, is to be a close fitting lid on the top, or in the back, notwithstanding its entire unity. A shelf, or shelves, may be placed on ledges within, or there may be a spit crossing it in the usual way. The tin case, and also the separate peices, are to be so formed and placed as to reflect the heat where it is most wanted.

In what part the claim to a patent resides, we are not informed.

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22. For an improvement in the *Coffee Mill;* Edmund Parker, and Heman White, Meriden, New Haven county, Connecticut, June 22.

This coffee mill is a modification of the cast iron vertical coffee mill most generally in use. There is, however, some difference in the mode of combining the parts, and for these the patent is taken.

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23. For an improvement in *Clocks;* Rufus Porter, Billerira, Middlesex county, Massachusetts, June 22.

Some new combinations are made in the escapement, and in the arrangement by which the hour hand is acted upon. There is to be an alarm, the weight of which, in its descent, acts upon a lever, and causing it to strike upon one of the magic matches, the match is in-

flamed, and this in its turn lights a candle. These are the points claimed.

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24. For *Apparatus for destroying Bed Bugs by Steam;* Benjamin Overman, Greensboro, Guilford county, North Carolina, June 22.

Several years ago an apparatus was figured and described in the London Mechanics' Magazine, and in some of the other periodicals of the day, for destroying bed bugs by steam. It consisted of a boiler somewhat resembling a tea kettle, with a pipe leading from its upper part to conduct the steam into corners and crevices. Below the boiler was a chauffer for containing coals, and a receptacle for catching the ashes.

The apparatus before us is essentially the same, but a form is given to it which will render it more costly, and less convenient to use than the one first noticed. The boiler is to be a double cylinder of tin, the water being contained in the space between them, and the fire being made in the inner one, which forms the furnace. A tube, like that before mentioned, is attached to the upper part of the boiler.

The patentee does not describe the mode of applying his machine, or claim any part of it, and as it is old in principle, his course in this particular has been a correct one.

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25. For a *Surgical Machine for extending the Leg and Thigh;* Joseph Merrill, Glasgow, Barren county, Kentucky, June 22.

The surgical machine described by the patentee, is an instrument for extending a fractured leg, or thigh, and for straightening crooked limbs. The leg and thigh are to be laid on a hollow trough of wood, which is furnished with a joint just under the knee, in order that it may be inflected there if necessary. An apparatus of screws and nuts confines it in its place. Near the lower end of it a foot piece projects up at right angles from the trough, upon which it is made to slide backwards and forwards, by means of a screw to adjust it to the length of the limb. The upper part is to be fastened to the thigh by bandaging, and the foot is to be secured to the foot piece in the same way; by turning the screw last spoken of, the foot will be drawn down, and the limb extended. The following instructions are given for setting a fractured limb—"Apply the machine first to the well limb, and thus ascertain its natural length; fix the machine at that length, and apply it to the fractured limb. If the fractured limb is contracted, turn the screw until it is drawn to the right length."

We presume that the patentee is one of those persons denominated natural bone setters, as the instructions given are not such as we should expect from the skilful surgeon. This, however, is a question of little importance, as every liberal minded man would welcome an improvement in surgical instruments from any quarter; it so happens, however, that the instrument above described is not new in

any one of its essential features. The joint under the knee, with a screw to fix it at any angle, the foot board, and its tightening screw, are figured and explained in several surgical works. They may be seen in fig. 6, plate 515, of the New Edinburgh Encyclopedia, referred to at page 597, vol. 17, Am. Ed.

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26. For a *Rotary Pump*, called the "Spring or drop valve pump;" Eli Kendall, Ashby, Middlesex county, Massachusetts, June 22.

This pump is on the same principle with a number of other rotary pumps, and steam engines. There is an outer cylinder, or drum, with closed ends, and within this an inner cylinder is made to revolve by means of a crank attached to one of its gudgeons which passes through the centre of one of the heads of the outer cylinder. The chamber of the pump is the space between the inner and outer cylinders. This chamber has a partition, or stop, filling it up at one point; at one side of this partition is a tube for admitting, and at the other a tube for discharging water. Two metallic valves, filling the capacity of the tube, slide into the inner cylinder as they alternately pass the partition, being forced to do so by the bearing of their outer ends against a strip or plate of metal which acts upon them as a cam.

There is no claim made, and as we have frequent occasion to remark, little, or nothing, upon which to found one.

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27. For a *Washing Machine;* Ira Avery, Springville, Susquehanna county, Pennsylvania, June 22.

A tub of the diameter of three feet, and a foot and a half in height, has a shaft passing through it by which it is made to revolve. The bottom of the tub is covered with radiating fluted boards, extending to a projecting hoop or rim which converts the outer part of the tub into a circular trough. A conical fluted roller is to revolve upon the fluted bottom, such an inclination being given to the latter as shall adapt it to the form of the conical roller. The tub is placed in a frame with its shaft standing obliquely, and the tub itself, consequently, inclined. The fluted roller revolves on a metallic rod which passes through it, the other end of the rod being formed into a ring, or hook, by which it hangs loosely upon the shaft; by this contrivance the gravity of the roller causes it always to remain on that part of the bottom which the inclination of the tub causes to be the lowest.

There is no claim made, although there is quite as much upon which to found one as there is in a large proportion of the patented washing machines. Tubs with fluted bottoms, and conical fluted rollers, have been patented, but the tubs revolved horizontally, whilst this then, like "the great globe itself," has its axis inclined.

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28. For a *Churn;* Jesse Ladd, Holderness, Grafton county, New Hampshire, June 22.

A vertical tub, with a vertical axis, carrying four, or any other number of dashers, has its gudgeon passing up through the lid of the

churn. A pulley, or whirl, upon the shaft, has a rope round it, and there is a contrivance for drawing upon the two ends of this rope alternately, by means of a lever, thus causing the dashers to vibrate. A similar motion was described in the churn mentioned in No. 5, but the present has the advantage of fewer parts.

The claim is to "the application of the principle of the lever to the shaft of the churn, so as to produce its vibrating motion as above described."

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29. For an improvement in the *Wooden or metal Cock or Spigot;* Jacob Bright, Sunbury, Northumberland county, Pennsylvania, June 22.

This cock, or spigot, is closed by a conical valve, at that end of the barrel, or stem, of the cock which enters the vessel from which the liquor is to be drawn; the spout of the spigot stands at right angles to the stem of it, at the distance of about an inch and a half from its outer end. Within this projecting part is a spiral spring, which keeps a brass wire forced forward, and thus closes the conical valve at the other end. This brass wire passes through a leather collar at the end of the spiral spring, for the purpose of preventing leakage; and when by pressure upon a knob, or button, at the front of the cock, the wire is forced inwards, the liquid is allowed to run, by the opening of the valve.

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30. For a *Machine for manufacturing pins;* John J. Howe, North Salem, West Chester county, New York, June 22.

In the ordinary mode of manufacturing pins, the wire is first straightened in considerable lengths, these wires are then cut, a number at a time, into lengths of six or eight inches; the next operation consists in pointing these wires at both ends, which is also effected a number at a time; as many of the wires as can be conveniently laid upon the index finger, be held down in a row, and rolled over by the action of the thumb, are brought into contact with stones, or file cut disks of steel, in rapid motion, and thus pointed, the same operation being performed on each end. The length of a pin is then cut off by an apparatus again operating on a considerable number, and the pointing and cutting are thus repeated until the whole wire has been used. The operation of heading is performed upon each pin singly; the twisted wire is slipped over the pin, and receives three or four blows in the heading apparatus, which fixes it firmly in its place. With the exception of this last, all the processes are performed upon many wires at one time.

Several machines have been made for the purpose of manufacturing pins; in some of them the heading has been performed like that of cut nails, by heading dies forcing up a portion of the wire of the shank, so as to form the head out of the solid stuff; the pointing, the cutting off, &c. have also been performed in the same machine. In that the description of which is before us, "the wire is straightened, cut into lengths, headed, pointed, and the pin delivered from it in a state ready for whitening." Although upon each individual these

operations are performed successively, they are going on simultaneously upon different pins. Such a machine is of necessity complex, and the full exhibition of its manner of operation would require a considerable number of drawings. All we can at present say upon the subject is, that we have seen pins which were manufactured by it, and which were good, although they were the early products of the first imperfect machine.

We hope soon to hear of the apparatus being in full operation, as from the ingenuity of its construction, and its promising appearance, we think it worthy of a fair trial. The principal questions respecting it which remain to be settled, are, whether, as the pins are made individually, that rapid motion can be given to the machine, and the pins be transferred from one part of the apparatus to another without interfering, so as to deliver them in sufficient numbers to warrant this mode of making them; and whether, from accidental defects in the wire, or from other causes, the parts of the pin will not sometimes take a wrong course, and obstruct the action of the machine. This is not an unfrequent accident in complex instruments which are to perform a considerable number of operations upon the same article. Whitney's card machine, however, may encourage us on such a question.

After particularly describing his machine, the patentee says, that "Although the individual parts of the before described machine, such as the levers, cams, wipers, forceps, dies, wheels, pinions, and other appendages, are the common elements of many other machines, and several of them have been used in instruments for manufacturing pins, and cannot therefore be claimed as new, I have yet so combined them as to give a specific character and action to my machine, producing by these new combinations new and useful results; and it is therefore upon this combination of parts that I mainly rest my claim to its exclusive use." Besides this general claim, there are some individual parts which appearing to be new, are claimed as such.

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31. For an improvement in the *Apparatus for manufacturing Soda Water;* Joseph H. Loring, city of Philadelphia, June 22.

The apparatus described by the patentee he calls a "portable mineral water apparatus, or generator for impregnating soda, or mineral water, mead, &c. with carbonic acid gas." A patent had been previously taken by the same gentleman for an apparatus very similar in its construction, but not having the specification of that patent before us, we do not know what portion of the one now patented is new. He, however, seems to have reduced the gas generator to a more portable size, and he also claims the particular construction of a valve, or stop cock, now used by him; these constitute the whole which we find in the claim.

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32. For machinery for *Dressing Yarn preparatory to weaving* Samuel Batchelder, Saco, York county, Maine, June 22.

(See specification.)

33. For an improvement in the *Steam Engine and in its mode of operation;* La Fayette Tibbitts, New Glasgow, Amherst county, Virginia, June 22.

In his petition the patentee sets forth the nature and object of his improvements, stating that "they consist in doing away the crank motion, and the other machinery in the present steam engines, from and after leaving the piston rod, by double racks of cast iron teeth, two spur wheels, two catch wheels, latches and springs, plying between said racks of teeth; also the two water wheels, shafts, and the gearing annexed and attached, and the whole improvements of machinery when all combined and in gear; the steam piston rod when in action operates backward and forward, the double racks of teeth which sets in motion the whole machinery of said improvement, propelling the steam-boat stern foremost as well as head foremost." Although to most of our readers there will be much obscurity in the foregoing announcement of splendid discoveries and magnificent improvements, those individuals who have made themselves acquainted not only with the successful attempts at improving the steam engine, but also with the history of those numerous abortions which have disappointed the pregnant hopes of a host of projectors, will recognise in the foregoing announcement the double rack and ratchet wheels which have frequently been applied to do away with the crank, and thus to substitute a complex and inadequate apparatus for one which is most perfect in its operation, bringing the piston rod, and its massive appendages, from a state of motion to one of rest, in the most gradual and advantageous manner, and preparing the whole for the return stroke without the jolts, the backlocking, and friction, attending the double rack motion, and similar substitutes for it which have been essayed.

We could refer to previous numbers of this journal, to other works, and also to the files of the patent office, as affording abundant evidence that so far, the proposed improvements are old, and have been long since thrown aside as worse than useless.

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34. For machinery for *Spreading Lime upon Land;* Mark L. Wilson, Quakertown, Bucks county, Pennsylvania, June 22.

This machine has a body resembling that of a cart, in which the lime to be spread is contained. The fore and back plank of this receptacle incline inwards towards the axles upon which the wheels of the vehicle revolve; they thus tend to carry the lime towards these axles. There are two wheels each fastened to an axle of iron one and a quarter inch square. Each wheel has its own axle, the two meeting in the middle of the body of the cart, and running in boxes provided for them. There is a slot or opening across the body, within which the axles revolve, and by their square form, serve to crush the lime, which then falls through underneath, as the cart is drawn forward.

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35. For a *Horizontal Current Water Wheel,* and inclined

race wheel; John Nuckalls, and Solomon P. Wheeler, Boliver, Hardeman county, Tennessee, June 22.

Both these wheels have buckets which are suspended from horizontal arms projecting from a vertical shaft. The particular mode of fixing them could not be described without writing a longer article respecting them than we are just now inclined to produce, particularly as we do not see any thing in them which leads to the conclusion that they will surpass in usefulness other wheels of a similar character, and that is saying but little in their favour.

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36. For a method of *Extracting the Alcohol used in the stiffening of Hat Bodies;* William M'Coy, Northumberland, Pennsylvania, June 22.

The hats are placed over a boiler and are covered with a box like a still head, from which a pipe proceeds, entering a worm contained in a refrigerator. Although the alcohol which may be contained in the varnish used in stiffening will be separated by this means, yet as all the heat by which the distillation is effected is produced by the vapour of water which comes in contact with the bodies, it must be obtained in a very diluted state. The patentee, however, has, we presume, ascertained that the process will more than pay the cost.

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37. For *Wheels, or Rollers, for destroying Friction*; James D. Cobb, Lebanon, Warren county, Ohio, June 22.

These friction rollers operate somewhat like those of Garnett, but neither the rollers, or their bearings, are cylindrical. The peripheries of the friction wheels, or rollers, have the form of truncated hemispheroids, and their bearings that of truncated cones, or vice versa. These forms, however, may be varied, and the principle of their action still remain unchanged: thus, for example, the bearing points both of the rollers and of the parts of the gudgeons against which they rest and revolve, may both be spherical. The manner in which the parts are combined could not well be described in words; but the subjoined quotation from the specification will fully explain the views of the patentee.

"From a cursory examination of the above described apparatus, it might be viewed as a mere variation of the well known friction rollers of Garnett, before named; but upon a more careful inspection and comparison, it will be found that they have but little in common between them, excepting the principle of converting the rubbing into rolling friction; the form of my rollers, of their bearings, and of what I have called the box, or shell, being different from his, and also from all others which have been since proposed or made; a difference not resulting from fancy or caprice, but essential to the attainment of the object which I have in view, of making the parts which successively sustain the load, as near as may be mere points, by which all rubbing friction will be as far as is possible avoided. I therefore claim as my invention the general construction and arrangement of the before described apparatus for reducing friction. And first, I

claim the manner of constructing the box, or shell, to receive and guide the axles of the friction wheels, and retain them equidistant from and parallel to each other. Secondly, the particular form given to the friction wheel, and to the rests, or guides, by which they are made to touch each other in a point, or points, only. Thirdly, the mode of tightening or adjusting the rests, or guides, as adapted to friction wheels of my construction, whether made in the precise form herein set forth, or in any other which attains the same end."

Friction wheels upon this construction would undoubtedly operate much better than those of Garnett in one particular, namely, in being free from that effect called gathering, which is unavoidable in long bearings, as perfect truth is unattainable in work of this description, and even if attained, it would soon be lost by any unequal wear of the gudgeons, or other parts. Perfect hardness in the materials used, however, can no more be attained than perfect truth in their formation; and as the bearing in these rollers is but little more than a point, the danger is that when pressed by a heavy load, numerous, though small depressions, will be produced, and these constantly accumulating, interfere with the benefits expected from the proposed construction. When the load is small, and great velocity alone is required, this objection may not exist.

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38. For an improvement in the *Fly Net for Horses;* Henry Korn, city of Philadelphia, June 22.

Two patents for the fly net have been previously obtained by the same gentleman, one on the 12th of September, 1829, the other on the 8th of December, 1831, upon each of which we made some remarks. The present patent is obtained for attaching a crupper to the fly net, by two small buckles, or in some other way. There is no drawing, but a specimen of the invention is mentioned as having been sent to the patent office. For the correctness of this procedure we refer to our former remarks.

The present patent appears to be taken without the slightest necessity for so doing, for if the patent for the fly net itself was valid, no one could, by adding a crupper to it, claim it as his own. If it was invalid, the crupper will not establish it in law, however firmly it may fix it on the horse's back.

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39. For a *Churn;* Simeon Power, Lawrenceville, Tioga county, Pennsylvania, June 23.

This churn, we are informed, "is designed to be an improvement on the common churn, and all other churns now in use," but notwithstanding the goodness of this intention, it is impossible for any article to be superior to itself, and by parity of reasoning it cannot be superior to another which is its exact counterpart. Now it so happens that in the crowd of these instruments which have found their way to the patent office, and have paid thirty dollars a piece for permission to take up their abode there, more than one or two such may be found which are much older inmates than the present one.

The body of the churn is a vertical tub, or box, in which there are two dashers, each filling one-half of its capacity. The two dasher rods are attached to levers vibrating like scale beams. These levers are operated upon by pitmen, which raise one and lower the other at the same time. To aid the labour a fly wheel is added, and there is of course a shaft, and its handles to commence the motion.

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40. For an improved *Hoe;* Benjamin Hinkley, Fayette, Kennebeck county, Maine, June 23.

A steel plate, six or eight inches square, forms the blade of the hoe. In the centre of this plate a socket is fixed, which rises vertically from it to the height of an inch and a half. This socket is to have a bore of about half an inch, and must be sufficiently thick to receive a tapped screw through its side; a piece of common gun barrel would answer the purpose. A piece of iron is fitted into the tube, where it may be tightened by means of a screw; the part that projects out is formed into a tine, and is bent down to an angle of forty-five degrees; this part is then driven into the hoe handle, and the hoe is complete. The design of this construction is to allow the hoe to be turned in any direction, so that either side or corner may be used.

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41. For a mode of *Increasing the power of Steam;* Nathan P. Goodall, Kirtland, Geauga county, Ohio, June 23.

A boiler made in the usual way, is to have a steam tube, proceeding from the top of it, bent down so as to enter the furnace under it; this tube is to be recurved and allowed to cross the fire place any number of times, or it may be used as bars for supporting the fuel. From the fire place it passes into a cistern containing water, into which its open end dips; from this cistern the steam which is generated is to be conveyed to the cylinder of a steam engine, or wherever else it may be required. The steam, in passing through the tube within the furnace, becomes highly heated, which excess of heat is communicated by it to the water in the cistern, a portion of which is thereby converted into steam.

The claim is to heating the steam in tubes after it leaves the boiler; and to the method of regulating its temperature by passing it into a cistern of water.

Although by this process heat may be communicated to the steam, and economy be, apparently, thereby promoted, there will be no small danger of burning the steam tube out, or rather this effect will certainly be produced in a very short space of time. Besides this, whatever degree of pressure exists in the boiler, the pipe, or the cistern, will also exist in the whole of them, as they communicate with each other; whenever, therefore, the steam tube becomes weakened by too elevated a temperature, an explosion will ensue from its giving way.

42. For a *Machine for Moulding and Pressing Bricks;* David Phillips, Natchez, Adams county, Mississippi, June 23.

This machine appears to differ in its general construction from those which we have previously examined; but the description of it is too obscure to admit of our attempting an explanation of its mode of action; we are compelled, therefore, to pass it by.

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43. For an improvement in the construction of *Vats, or Letches, used for Tanning;* William Brown, Herkimer county, New York, June 23.

The first improvement claimed is the constructing the sides of the vats of a single board, or plank, having posts, formed of pieces of scantling both within and without; the lower ends of these pieces or ribs of timber, are mortised into the sills which support the floor. This mode of making them is stated to obviate the necessity for caulking; and to allow any number of vats to be connected without the necessity for double partitions.

The second improvement is in the conveying trough, along which the bark is to be carried to feed the letches. A horizontal beam passes along the top of the trough, being suspended there by means of two vertical rods hanging from cross trees above the trough. This horizontal beam is so hung as to be capable of having a vibratory motion given to it, lengthwise of the trough. From the bottom of it hang leaves, or buckets, which nearly touch the bottom and sides of the trough; these are so hinged as to rise one way, but not the other. By swinging the beam the bark is drawn forward, whilst in passing back, the hinged buckets slide over it, and at their return again advance it.

This patent is obtained as supplementary to one previously granted to the same person for improvements in tanning.

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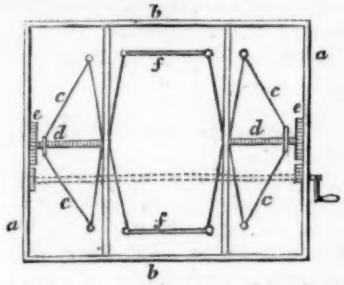
44. For *Improved Lime Kilns;* Samuel Griscom, Reading, Bucks county, Pennsylvania, June 26.

This kiln is to be quadrangular and vertical, twenty feet in length and ten in width, and of a proper height. In erecting it, walls of sixteen or eighteen inches in thickness are to be built parallel to each other, with intervals of eighteen inches between them. These walls are to be ten feet in length, and the extreme ones being about twenty feet apart, become the foundation for the end walls of the kiln. The front and back walls are erected on the ends of the parallel walls, the intervals between which form rows of openings like those of a brick kiln. In one wall there is to be an opening, or doorway, of four feet by five, for introducing the lime stone and fuel. The lime stone is first to form a layer upon the parallel walls, and upon this is to be laid anthracite coal, such layers alternating with each other until the kiln is filled.

Wood is to be placed in the intervals below, and this being ignited sets fire to the coal, which is allowed to burn out.

45. For a *Standing Press;* Aaron Hale, Boston, Massachusetts, June 26.



This standing press is to operate by means of toggle joints, in a way which will be understood by the sketch in the margin. *a a a a* are cheeks, or uprights, framed into *b b*, the top and bottom timbers, *c c c c* are the levers of toggle joints, in the middle of each of these there is a nut through which the screws *d d* work, being turned by means of pinions placed upon a shaft which crosses the press and take into toothed wheels *e e*. There are two platens, *f f*, one of which is forced up and the other down as the levers of the toggle joints are straightened. To increase the power of the press, wheels and pinions occupy the place where the winch is shown.

The articles to be pressed must of course be placed between the two platens, where they will be very powerfully acted upon. We are at a loss, however, to discover to what use this press can be applied; its range will be very small, it cannot be made to follow up any article between the platens after the joints are once brought straight, and it loses its greatest effect excepting they can be straightened; if the goods are susceptible of greater pressure than they have received from this straightening it cannot be given. It will undoubtedly be a press of great power, where all the circumstances necessary to its exertion concur, but when will that be?

We noticed a toggle joint standing press at p. 164, vol. viii., patented also by a gentleman whose name is Hale. The joints in that were operated upon by tackle, a mode of employing power very inferior to that now proposed.

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46. For an improvement in the *Plough;* George Wolf, Fairfield county, Ohio, June 27.

This patent is obtained for an addition to, rather than an improvement in the plough; the object being to combine with the plough an apparatus for planting corn. On the top of the plough, and close to the handles, there is a small funnel shaped hopper, into which is put the grains of corn intended for planting; from this hopper a tube leads down, between the mould board and land side, through which the corn is to be dropped. To regulate the planting there is a sliding piece immediately under the hopper, which is drawn back by a spring, thus cutting off the communication between the hopper and the tube. Under one of the handles of the plough, and close to where it is grasped, there is a trigger, from which a wire leads which acts upon the slide. When the corn is to be dropped, this trigger is pressed, and

the slide brings a regulated quantity of corn over, and drops it into the tube: a scraper behind the mould board covers the corn.

The only objection which we see to this plough, is the impossibility of planting corn by it in regular squares, so that it can be ploughed both ways; it may, we believe, be planted with tolerable regularity in a line in one direction.

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47. For an improvement in the *Plough;* George Crowl, Sleepy creek, Morgan county, Virginia, June 27.

A shovel plough is to have the shovel pointed at both ends, like the common coulter, so that it can be turned when one end is worn. The contrivance in this particular is not new, nor do we see any thing in any part of it worthy of particular notice. The whole is described without designating what is considered as new.

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48. For *Protecting Ships from Lightning;* Elisha L. Keen, city of New York, June 27.

A truck made of glass is to be placed on the top of the upper mast; and upon each of the mast head caps, covers of glass from half an inch to two inches in thickness are to be placed.

These non-conductors being so placed, we are assured that the commanders of vessels may bid defiance to Jove himself, as they will be "completely secured" against his attacks. We are likewise told that whenever lightning strikes a mast, it always enters at top, disdaining to enter sideways, and that "as the lightning rod of iron attracts and conducts when on perpendiculars, so will glass repulse and protect similarly situated."

Notwithstanding the logic of this conclusion, we are still unconvinced. We should place just as much confidence in a glass night cap, or a bonnet of the same material, to protect the person against the attacks of the thunderer, as we should in these caps to ward off his blows upon the head of a mast. The fact is, that the whole thing manifests an entire absence of information respecting the nature of the power, or agent, a defence against which it is proposed to furnish. The best and the only known security in such a case is a good, and continuous metallic conductor.

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49. For a *Horse Power* for propelling machinery; Timothy Showerman, Covington, Genessee county, New York, June 27.

The name of *horse power* has become technical, and is applied to any apparatus by means of which a horse is made to exert his power in propelling machinery; we do not like the appellation, nor do we think that any generic name was needed for apparatus of this description, or that it is applied with any more propriety to the common gin, or the inclined wheel, than it would be to a cart or a stage. But dropping this technological disquisition, let us pay some attention to the machine before us.

We do not, however, turn to this task with any thing like pleasure, as, after a fair examination of all that the patentee has to say in its

favour, we are compelled to disallow its claims, and to pronounce upon it a sentence of condemnation, as not justifying the character given to it.

A vertical shaft is fixed in the usual way, and on the upper end of it is placed a horizontal wheel, with cogs upon its periphery; so far at least all is old. This large wheel is to drive another of one-fourth or one-fifth its diameter, and this last is to act upon a pinion having a drum or band wheel upon its shaft. The large horizontal wheel, we are told, should be of the same diameter as the circle in which the horse walks, say twenty feet, and it is the leverage of this part, we suppose, which is to furnish the extra power. All that the patentee has to say upon this subject is, that he claims the putting of cog wheels together "so as to propel machinery with a less number of horses." We are perfectly willing, let him do so, *if he can.*

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50. For a *Churn;* Isaac Van Gorder, Warren, Trumbull county, Ohio, June 27.

In this churn there are to be two vertical shafts, each of them carrying arms, or dashers, which in their revolution, or vibration, pass between those of its fellow. Upon the top of each of these shafts there is a whirl, or pulley, having a rope passing round it, the ends of which ropes are attached to the periphery of a vertical wheel. By giving a vibratory motion to this wheel, the shafts and dashers are caused to revolve. The claim is to "the manner of applying the cord to the pulleys for the purpose of churning."

The *manner* of doing this, it will be seen, resembles that of another churn patented on the second of this month, (June,) see No. 5. It may be observed that both the patentees reside in the same place. The main difference in the churns consists in the use of double dashers in the last; another churn, similar to these, was contributed by New Hampshire, on the 22d inst. (No. 28,) which has the same moving apparatus, and a single shaft.

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51. For a *Brand, for Branding Barrels, Packages, &c.;* Samuel Huse, Newburyport, Essex county, Massachusetts, June 28.

(See specification.)

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52. For a Tracheater, *for curing the Croup in Fowls;* Thacker V. Bush, Clark county, Kentucky, June 29.

(See specification.)

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53. For a *Circular Rail-way Saw Mill;* Allen B. Reynolds, Cincinnati, Hamilton county, Ohio, June 29.

Most persons have heard something about going round Robin Hood's barn, and we have now an opportunity of presenting a vehicle in which the circuit may be performed.

A circular rim of any required diameter is to be made of wood, and placed horizontally on suitable supports, the *upper face* of this

circle is to be "*shod* with plates of iron," and this forms the circular rail-way. A moveable frame, or carriage, to which the saw mill is attached, is then placed upon the rail-way, having four rollers, or wheels, on its under part, which rest upon the iron facings. The axles of these wheels, or rollers, extend to the middle of the circle, where they are supported in boxes, and have on them fly wheels, and a crank, or cranks, to give motion to the saw frame. The saw mill is constructed in the usual way, the log placed on it, and water, steam, or animal power, applied to turn the frame with the whole of its appendages, log and all, round, when the friction of the rollers upon the rail is to drive the entire machinery.

"The invention here claimed, is the before described method of turning mills and machinery, by causing them to turn on a circular rail-way, and thus giving motion to them by cranks, or other suitable gearing."

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54. For a *Washing Machine;* James M'Collam and Nathan D. Howe, New Petersburg, Highland county, Ohio, June 30.

This machine operates like the common dasher churn, the rod being worked up and down by a lever fixed in the manner of a pump handle. The dasher is made double, with spiral steel springs between the two parts, to allow the lower portion to recede when it comes in contact with the clothes. The bottom of the dasher, and the sides of the tub are fluted. A cover fits the top closely, and steam from a boiler is to be admitted through a pipe. The claim is to "every thing peculiar in relation to the machine, excepting the introduction of the steam." Why except this if it is peculiar?

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for an improvement in the mode of Dressing Yarn, by which that preparatory operation in the business of weaving is greatly facilitated. Granted to SAMUEL BATCHELDER, *Saco, York county, Maine, June* 22, 1832.

The yarn in its course from the sizing rolls and brushes, to the measuring rolls, is usually dried by the employment of revolving fans, running in boxes; and sometimes a current of heated air is made to blow upon it for the same purpose. By my invention the revolving fans and the heated air are dispensed with, the yarn being effectually dried without their aid. For this purpose I make my measuring rollers hollow, or use separate drying rollers; forming them of copper, or other suitable substance, and cause steam, or heated air, to be conducted through them, by means of hollow gudgeons in the same way in which calender and other rollers are sometimes heated. As the mode of doing this is well known to those in the habit of con-

structing or using such machinery, it does not require to be described by me.

Although I consider steam as the most convenient vehicle of heat in the above apparatus, it is manifest that hot water, metallic heaters, or other articles, may be employed to heat the measuring rollers; I do not, therefore, intend to confine myself to the use of steam exclusively; but what I claim as my invention, is the using of a cylinder of metal, heated by steam, or otherwise, in the usual place of measuring rollers, or in any other situation where they can be placed in contact with the yarn for the purpose of drying it, instead of the fans, or heated air, heretofore employed for that purpose.

SAMUEL BATCHELDER.

Specification of a patent for a Brand for Branding Barrels, Packing Cases, and other articles; denominated the Box and heater Brand. Granted to SAMUEL HUSE, *Newburyport, Massachusetts, June* 28, 1832.

The part by which the branding is effected, is a plate of metal, which has on one of its sides projecting letters or figures, which letters or figures are usually cast with the plate which forms the foundation of the whole apparatus. The plate, however, may be made of wrought metal, and may have shifting letters or numbers when required; and these may slide into a groove, or be otherwise confined to its face. On the upper side of the plate, and near its edges, I usually raise ledges of from one-fourth to three-eighths of an inch in thickness, and from half to three-fourths of an inch in height. I also construct a double box of sheet metal, the two parts of this double box having a space between them, which is usually about three-eighths of an inch; rivets, or straps, being used to keep them in their relative situations; the spaces between these two parts, at its lower edge, receives and fits close on to the ledges on the upper side of the plate. This space may be left void, or may be stuffed with charcoal, or any other bad conductor of heat. A handle rises from the edges of the lower plate, in the form of a bale, allowing the box or cover to be placed under it.

When the brand is to be used, heaters of cast iron, or other material, are placed upon the plate; when it is small, the heater may be in one piece; when large, it may be in two or three pieces. The heater, or heaters, are to be covered by the box, which will prevent the heat from being dissipated.

Instead of having the double box to lift off, it may be attached to the lower plate, and there may be a slide, or door, on one side, to admit the heater, in the manner of the old fashioned box irons. The plate and box may be made round, oval, or in any other desired form, and the instrument may sometimes be used without the box,

but this will not be done where many articles are to be branded, and economy or convenience is consulted.

What I claim as my invention, and for which I ask a patent, is the application of heaters of iron, or other metal, to one side of a metallic plate, having its opposite side furnished with the letters and figures with which barrels, packages, &c. are to be branded. I also claim the use of a box to cover the heaters used in branding, in order to prevent the dissipation of the heat.

SAMUEL HUSE.

Specification of a patent for a TRACHEATER, *for curing the Croup in Fowls. Granted to* THACKER V. BUSH, *Clark county, Kentucky, June* 29, 1832.

To all whom it may concern, be it known, that I, T. V. Bush, of Clark county, in the state of Kentucky, have invented an instrument for curing the disease commonly called the croup in fowls and poultry in general, which instrument I denominate a tracheater, and that the following is a full and exact description thereof, and of the mode of using the same.

I take fine wire, of any suitable metal, and not larger, in general, than that of a cambric needle, but varying in size as it may be found necessary; this wire I wind, or coil, round another wire, so as to form a spiral spring; in winding it, however, I do not do this closely, but allow a space between each coil. The wire when thus wound presents the appearance of a hollow elastic screw. The diameter of the instrument may vary from one-twentieth to one-tenth of an inch, more or less, accordingly as it is intended for very young chickens, or for fowls of a larger size. From four to five inches will be a sufficient and convenient length.

This instrument is to be passed into the trachea, or wind pipe, and to prevent injury in passing, the wire forming the end of the fore coil is bent inward. At the opposite end there is a handle, which may consist of the quill end of a feather, a round piece of wood or any other article which can be conveniently whirled between the finger and thumb; it is then complete, and ready for use.

When the instrument is to be used, the chicken, or fowl, is held on the knee, its mouth opened by the pressure of the finger and thumb of the left hand, and the instrument introduced with the right. In order to do this readily an assistant draws the tongue forward, which exposes the glottis. By rolling the instrument between the finger and thumb it enters very readily, its screw form advancing it without the necessity of using force, and in this way it will descend nearly its whole length. If it meets with any obstruction a slight turn in the opposite direction relieves it, when it is to be gently drawn out, rolling it, whilst retracting it, as though it were

descending. The worms and mucus which have caused, or accompanied, the disease, will be collected between the coils of the wire, and, by repeating the operation, the whole will be removed. The instrument should be lubricated with oil, molasses, or any suitable article.

What I claim as my invention, is the foregoing instrument, made by coiling wire spirally, in the manner, and for the purpose hereinbefore described.

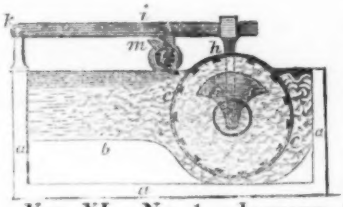
THACKER V. BUSH.

Remarks by the Editor.—The affection in Fowls which this instrument is designed to remove, is not the croup, properly so called, but it is highly probable that chickens, said to have the croup, are frequently gorged by the swallowing of worms, and that these may be removed in the way pointed out by the patentee. The patent itself, however, appears to be one of those not likely to prove profitable to the inventor, as individuals will be unwilling to pay much for the use of such an instrument; and when chickens require relief in this way, those who are able to twist a wire, or who have a piece of an old suspender spring, will not undertake to send to the patentee for a right to use it. When the chicken is choaking the disease will not wait for the Doctor.

ENGLISH PATENTS.

Specification of a patent for certain improvements in manufacturing Paper. Granted to JOHN DICKENSON, *Esq., January* 10, 1832.

It is obviously a very important point in the manufacture of paper, to obtain a perfectly uniform and smooth pulp, that the article produced therefrom may be of a firm and even texture. To attain this object in a most perfect and least objectionable manner, many contrivances have been patented in this country as well as others. Our readers will observe in the present number, the specification of an American patent for the same purpose; and it is remarkable, that a somewhat similar arrangement has been devised both by the American inventor, and by our own talented countryman, Mr. Dickenson, (who, it must be acknowledged, has done more towards improving the quality of British papers, than any other individual,) the superiority of whose mechanism in this instance, over that of his foreign cotemporary, is very apparent.



The annexed figure is a diagram explanatory of this arrangement: *a a* represents a section of a vat containing the pulp, which is to be regulated by a *waste:* at *b* is a false bottom: *c c* is a rotary cylinder, through which that portion only of the pulp that is to be made into paper, passes;

the knots, grit, &c. being prevented from entering by the wires which envelop the periphery of the cylinder. These wires are arranged spirally by a continuous coil, in the manner of a squirrel cage, but so close together as to leave only the one hundred and fifteenth part of an inch space between them. The wire recommended for this purpose is to be drawn of the figure represented at fig. 14, the narrow, underneath side *d*, being fixed next to the cylinder, where it is to be fastened by rivets to the longitudinal bars *e e;* leaving the uniform space between the coils as before mentioned, which may of course be easily performed by a gauge. The spaces through which the pulp must pass are therefore longitudinal slits, two or three inches long, and only the 115th part of an inch wide. The ends of the cylinder are closed, except at the axis of rotation, which are formed of large tubes; through these the fine pulp received into the cylinder flows off to the mould on which the paper is formed. As there would be a continual liability of the fine interstices of the cylinders becoming clogged, unless some means were adopted to prevent it, Mr. Dickenson employs what is technically termed a float (though it does not possess that precise character,) which by an up and down motion agitates the liquid, and by changing the course of the current, or flow, through the wires, throws off whatever has accumulated on the outside of them. This float is a close vessel of strong copper, of nearly the length of the cylinder (four feet,) and of the sectional figure seen at *f f;* a horizontal bar passes throughout the lower part of this vessel, and also through the tubular axis of the cylinder, beyond the plummer boxes in which the latter turn, where the horizontal bar is fastened to a vertical bar, *h*, at each end, that are connected to a lever *i*, whose fulcrum is at *k*. At *l* is a double cam, put in motion by gear in connexion with the wheel that actuates the rotary cylinder; every revolution of the cam lifts the lever *i* twice, by means of the wipers *m m*, and through the medium of *h*, the copper float *f f* also about 1¼ inch each time, and the "float" being somewhat heavier than the fluid in which it is immersed, falls immediately afterwards, producing the required agitation.

A second improvement under this patent consists in the knives usually employed in the transverse cutting of the endless sheets of paper; these are usually two straight-edged blades, one of which being fixed, and the proper length of the paper drawn over it, the other descends and divides the sheet by a similar action to that of shears. In lieu of the upper moving knife with a straight-edge, Mr. Dickenson employs one of an angular or hollow curved form, so that its ends are brought into contact with the lower fixed one. [*Reg. of Arts.*

Remarks by the Editor.—The editor of the Register of Arts is entirely mistaken in his allusion to the American patent, which is that of Mr. John Ames, for *washing rags* in the manufacture of paper, and not for a pulp dresser, the two objects being entirely different. Pulp dressers, on the principle of that of Mr. Dickenson, were patented here at an earlier date.

Patent granted to ISAAC STROMBON, *for a medical composition or embrocation. Dated December* 17, 1831.

The specification is as brief as a prescription, and not quite so communicative or intelligible. The patentee secures his invention more by the mystery with which he has worded his specification than by the patent itself. His object is to make a composition or embrocation for the cure of certain complaints not specified. The means he uses is to mix up spirits of wine, laudanum, oil of cloves of the best quality, oil of cajeputa, spirits of hartshorn, spirits of camphor, and spirits of turpentine in certain proportions—but what those proportions are, the inventor does not specify. From the nature of the remedies, however, we suspect that the complaint to be attacked is *cholera*, and thence the proportions of these warm and exciting ingredients may be guessed with tolerable exactness.

To sooth pain and stimulate the powers of the body, and at the same time to promote a genial warmth, are objects likely to be achieved by this composition. Of course, it will not be used except by persons who have a patent for making it up, and whose knowledge of similar matters is sufficient to direct them in this.

[*Rep. Pat. Inv.*

Patent granted to JOHN SMITH *and* W. DOLIER, *Liverpool, for a durable Copy Book, or writing Tablet, and improved Delible Ink to be used therewith. Dated October* 14, 1831.

This is the most clearly expressed of any document we ever read. The invention is useful and novel, and is thus described. Take a piece of fine linen, stitch it on a frame, and rub it with pumice stone till every unevenness of surface is removed.

Then, make a priming of fourteen pounds of single size, of the best and cleanest, to one pound of whiting, and a quarter of a pound of linseed oil; let this be carefully mixed and applied equally over the linen, and when the first coat is dry, rub over with pumice stone and give another coat. Rub down again, and again repeat the sizing.

When this is quite dry, take white lead, Paris white, and linseed oil, mixed to the consistency of molasses, and lay it on with a trowel over the sized linen prepared as above described; give it time (three days) to dry, and repeat this coating also, concluding, however, with fine white lead and turpentine, to produce a dead ground. Care must be taken to let each coating dry regularly, and spread equally, and be sure that the surface is scrupulously rubbed down, and made quite smooth. The linen may then be cut into the right shape and size, and the pages bound in mill boards, or as you will. The copy book is then complete.

The delible ink is thus made. Take a gallon of water; with one pint of it mix one pound of gum arabic, melt it over a slow fire, add-

ing gradually from the gallon of water. If the ink is to be black, pour into the gum mucilage four ounces of fine lamp black, and mix it well by rubbing it between the hands; if any other colour be preferred, any water colour may supply the place of the lamp black.

Now the value of this ink which is delible, is in reference to the prepared copy book; any copy in writing, sum in arithmetic, map in geography, or subject in drawing, may be repeated by the student on his page, and rubbed out with a sponge as often as required. Here are, therefore, facility and economy combined, and, what is rather a dubious advantage, the surface of the paper, and the consistency of the ink, give a peculiar freedom to the writer. This advantage we call dubious, because the student may thence feel a more marked difficulty when he comes to write with common ink on common paper. Nothing, however, can lessen the value of the invention, which is manifest, and we have no doubt that these copy books or slates will be in general demand. [*Rep. Pat. Inv.*

Patent granted to JOHN CHRISTOPHER, *for an improvement in clothes Buttons. Dated October 7*, 1831.

This is the simplest and strongest button we have seen. The disk, or face, may be of copper, or horn, or white metal, or pearl, or shell, or steel, or any other substance, or it may be a mould, covered with cloth, or silk, or vellum, or paper. There is nothing peculiar in the outward face of the button, the novelty is in the shank. This part must project from the button back like a cork from a phial, or the stalk from an auricula, or a daisy. It is not to have an eye, or be turned over to be sewed on the coat as usual; but is to be straight and of some substance. It may be made out of the same piece of metal with the button, or it may be made separately, and soldered or rivetted on to the back of the disk. (The end of the shank is a smaller projection from the shank as the shank is from the button.) Now the novelty of the invention is a washer, or somewhat smaller plate of metal, which is sewed to the inside of the cloth, and when the thickness is pierced with a large bodkin, or stiletto, (as in making eyelet holes,) the shank we have described is put through the cloth, leaving the face of the button outside, and fitting tight into the aperture of the washer inside. It is here rivetted by a few light blows of a small rivetting hammer, and the button is complete.

It is of course exactly the same thing when the washer has the stem or shank, and the button itself the aperture; but in that case the rivet should be made ornamental.

Other plans are suggested; such as to make the shank of the washer a tube, and the shank of the button a rod to fit it. We might suggest another—the shank of the washer being a female screw, and that of the button a male screw, in which case the button could be removed and renewed at pleasure; but whatever mode be adopted, the invention is Mr Christopher's.

It applies to all the buttons in common use, to that of Mr. Sander's patent, and will apply to any button that can be invented. The button will sit closer, and the clothes fit better than by any other process. It will be necessary to have a little anvil covered with cloth, which may be secured to the shop board, and a hammer must always be at hand; with these implements no more is required, and the improvement is easily attainable. [*Rep. Pat. Inv.*

PERKINS *on the Generation of Steam.*

The following extract is made from a pamphlet* entitled "STEAM NAVIGATION. *Improvements by Jacob Perkins. Part I. The Boiler.*" We give so much as is necessary to exhibit the theoretical views of Mr. Perkins, and his experiments, and to show the application which they have found in his boilers. COM. PUB.

Extract.

Mr. Perkins has observed that, in the process of heating water and other fluids, small bubbles are formed, seeming to adhere slightly to the vessel used, showing themselves long before the liquid begins to boil, and forming more rapidly in situations against which the heat strongly impinges. He has also remarked that, if the heat be intensely strong against portions of a common boiler, the fluid contents are, by the rapid creation of these bubbles, driven off from continued contact with the inner surface of the boiler, and a non-conducting, or slowly conducting partition of vapour, in the shape of bubbles, intervening between the boiler and its fluid contents, the material of the boiler takes up heat much faster than it gives it off to the water: the consequence being that, if the fire be intense, the excess of heat goes into the material of which the vessel is formed, but not freely through it into the fluid contents; and that, in proportion as the heat is increased beyond a limit *hitherto undefined*, so is the rate of boiling decreased, whilst mischief to the boiler is proceeding with augmented force.

Such are some of the observations which led to extensive, and, as they now appear, most valuable experiments. They were further induced by the notice of a fact of every day occurrence. Where the generation of steam has been the particular object in view, as, for instance, with a navigating engine, the engineer, who, by quickening his fire, has expected to increase the volume of steam, has often found himself deceived;—and the greater the intensity to which the fire has been driven beyond a given point, the more decided has been the disappointment arising from a failure to produce the expected and desired effect.

By the following experiment, Mr. Perkins has discovered the cause of such disappointment. He has found that *to produce the maximum effect*, the heat, applied to any boiler of the usual construc-

* For the use of which the committee are indebted to John Vaughan, Esq.

tion for the purpose of evaporating water, must be of one specific degree, which degree he has denominated the *evaporating point*. He has ascertained that whilst any degree lower than this *point* will produce a sluggish and diminutive effect, when compared with the rate of action at the *evaporating point*, so will any higher degree impede the rate of evaporation in proportion as the intensity of heat shall be increased: unless, in order to render available any heat beyond the *evaporating point*, some new means shall be introduced to counteract the repelling power of heated metal, and to force the water into positive and continued contact with it.

The merit of inventing such new means has been reserved for Mr. Perkins, and they will now be described; but first it may be useful to give the experiments, one of which gradually led to this important discovery.

An iron cup, of massive thickness, cast for the purpose, was immersed in a furnace, and raised to a white heat, and, whilst it was allowed to cool gradually, several measures of water were placed in it, one at a time, each in succession, as soon as the previous one had evaporated to dryness.

The 1st measure in evaporating occupied	90	seconds.
2nd ,, ,,	80	,,
3d ,, ,,	59	,,
The vapour, or steam, thrown off, began now to appear, and became more distinctly visible with the evaporation of succeeding measures of water.		
4th measure in evaporating occupied	30	seconds.
5th ,, ,,	20	,,
6th ,, ,,	12	,,
7th measure showed what Mr. Perkins has termed the evaporating point, and in a dense cloud of steam evaporated suddenly in	6	,,
8th measure occupied a longer period, viz:	10	,,
9th measure in evaporating occupied	20	,,
10th ,, ,,	32	,,

and the 11th measure did not boil.

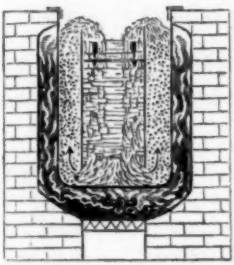
The first measure of water, although contained within the iron cup at a white heat, was perceptibly not in contact with the metal, but was repelled to some distance from it in a state of buoyancy, and there moved freely in every horizontal direction. So circumstanced, the water evaporated slowly; but when, by the evaporation of successive measures, and the lapse of time, the iron was cooled down to the evaporating point, the water then evidently came in contact with the iron, and the augmented rate of evaporation was as 90 to 6, or as 15 to 1, the rate being increased or multiplied fifteen times, or, in other words, a given quantity of water was converted into steam fifteen times as quick at a moderately low, as at an intensely high heat.

How vast a quantity of fuel is thus shown to be worse than use-

lessly applied in the ordinary process of working boilers for steam engine machinery, whether they be used for mining, manufacturing, or navigating operations; or, for the more recently required purposes of locomotive engines.

In applying to useful instead of injurious account, the highest degrees of heat which the strongest fuel can produce, the present invention of Mr. Perkins has proved eminently successful. It is this:—to a boiler is fitted a hollow lining, not extending throughout the boiler, but in proportion to circumstances, in order that a strong circulation in the water may be caused, and that, by driving a perpetual current forcibly against the inner surface of that portion of the boiler exposed to the fire, the whole of the heat may be taken up by the water. And here must be recorded the result of farther experiments. If two vessels be filled with water, one of them placed within the other, and heat be applied to the outer vessel in such a manner that none can reach the inner vessel, except through the water contained in the outer one, no steam bubbles can be made to arise in the inner vessel, whilst, in the outer one, steam bubbles are formed rapidly. The fluid in the outer vessel being composed of a mixture of bubbles and water, that in the inner vessel being water alone,—the contents of the two vessels, although of the same temperature, are of different specific gravities, the mixture of water and bubbles in the outer vessel is lighter than the unmixed water in the inner vessel.

Now if, of the inner vessel, the bottom be taken out, leaving the vessel open at top and bottom, but so placed as to be kept full of water, having its upper edge nearly level with the water surface in the larger vessel, and its lower edge supported at a moderate distance above the bottom of the larger vessel, as shown in the annexed diagram,—the unequal specific gravity of the fluid, when exposed to the action of the fire, will cause it to move in a circulating current.



The bubbles contained in the water of the outer vessel, adjoining the fire, will rise continually to the surface with a power, when at a low temperature, somewhat exceeding the difference in the specific gravity of air and water; but if the number of bubbles be increased by additional heat, the difference between the respective specific gravities will be increased also, inasmuch as a larger quantity of vapour will be present in the water between the inner and the outer vessel, and the rapidity and force of the upward action will augment in a proportionate ratio; and if the heat be greatly increased, augmenting the relative proportion of steam bubbles, still more rapid and powerful will be the force and rate of their current to the surface, (their bursting and giving off the vapour conveyed in them,) whilst the water, in contact with the bubbles, partaking of their influence, will rise in a current also, having a tendency to produce a vacuum in the lower portion of the boiler. At the same time, the fluid in the inner vessel being unmixed with

bubbles of vapour or steam, will, by its greater specific gravity, descend and continually arrange itself under the rising columns of the outer vessel, and so produce a circulating current.

The principle of this action, which is found to exist under numerous shapes of this new boiler, is attended by results of most important value.

It has been shown that the rising current will increase in power and rapidity with every increment of heat applied, and that the descending current will keep pace with it.

If a fire, composed of the strongest fuel, be urged with extreme intensity round a boiler of this construction, so rapid and forcible will be the rising current, that it will draw towards and carry up with it sand, gravel or stones, or almost any kind of heavy substance of moderate size which may happen to be in the boiler, sweeping off, in its ascent, all the steam bubbles which form on the interior surface of the outer vessel, keeping that surface cleared from every kind of vapour which would otherwise act as a non-conductor of heat, or form an impediment to the free passage of heat from the fuel to the water, effectually preventing the adhesion to the boiler of salt, lime, or earthy matter of any kind, and by forcing a continued succession of watery particles into actual contact with the metal, will cause them to take up all the heat at the instant of its formation, and accelerate the production of steam with astonishing rapidity.

Thus may water be converted into steam four times faster than by the common method; or, in other words, by an apparatus of this kind, of one-fourth the size and weight of an apparatus of the common kind, an equal quantity of steam of any required power can be made in a given time, saving

Three-fourths of the space occupied by the ordinary apparatus,

Three-fourths of its weight, and

Three-fourths of the inconvenience and danger arising from its bulky contents of heated water.*

An account of the important and successful results of experimental trials in Demerara, to obtain native raw sugar from the cane juice, by an improved operation of evaporation in vacuo. By Mr. Abraham Booth, experimental chemist, and lecturer on Chemistry and Natural Philosophy.

When England, by her maritime superiority, had obtained the whole of the continental West India possessions, a stimulus was

* The principle upon which the action of this boiler is founded, will, under modifications, prove applicable to many other useful purposes, and with a view to investigate and illustrate them with perfect accuracy, experiments are in progress: for instance—

In the evaporation of brine for making salt.

In the boiling of wort with hops for brewing beer.

In the process of distillation, sugar boiling, &c. the importance whereof will be obvious to individuals engaged in such pursuits.

given to the trade in sugar, which rendered the merchants who were engaged in it, distinguished for their wealth and respectability. Many causes have, however, recently operated in producing a depreciation in the value of this species of property; estates, the profits of which formerly produced annual fortunes, now encumbered by heavy mortgages, are a burden to the proprietors; and the colonies themselves, instead of proving a benefit, are actually a drawback to the mother country. No one connected with the history of our colonial possessions can doubt but that one great cause of this depression is in the inadequate return afforded for a most extensive outlay. When England possessed an almost exclusive monopoly of the supply of sugar to the whole world, plantations formed a very profitable channel for the employment of capital; extensive establishments were formed, and the whole of the land capable of growing sugar cane was put into active cultivation; but the return of peace, and the surrender of a large portion of the collonial conquests, gave the first shock to our West Indian interests, the effects of which have since been so largely and sensibly felt.

Planters, and West Indian proprietors, appear to have been aware that any legislative privilege which the government of the mother country could afford would be inefficient unless it was seconded by their local exertions. The method by which so large a quantity of deteriorated material as they were in the habit of procuring, in the shape of *uncrystallizable sugar*, or *molasses*, might be saved, suggested itself as a valuable consideration. The important advantages which might be anticipated, were this object effected—in a more adequate return from the plantations, and in a necessity for employing so large a number of hands—gave a stimulus to every research. It has thus ever afforded a source of speculative enterprize to industrious schemers, who have always found a market for their projects, however preposterous or visionary. The evaporation of the cane juice in vacuo, at the last stage of concentration, was proposed, not for the purpose of improving the molasses, but to prevent their formation, and thus it differed in its objects from the various schemes which had often been proposed. So often, however, had the planters been injured, and not unfrequently ruined by following the various specious plans which had been imposed upon them, that at its first introduction this process had to combat with all the obstacles which the failures of others had raised up against it. It has, however, already made such progress, that by the most competent judges it is considered to have opened a new era in the history of the colonies; as likely to revive the spoiled fortunes of the planters, and render these possessions a service of benefit, instead of an obstacle to the prosperity of the mother country. It may be noticed as somewhat extraordinary, that at the period when the apparatus was first sent to the colonies, some French adventurers were at Demerara, with a process, for divulging which they required the sum of *ten thousand pounds*, and that the question was then in discussion before the Board of Commerce. The important results of the present improved process, had, however, the effect to put a stop to these negociations, and if the present is not the

perfection of the manufacture, it will, at least, be long before the colonies can boast such an important improvement in their staple commodity and support.

For the introduction of this valuable process, we are solely indebted to the indefatigable exertions of Mr. William Oaks, of Houndsditch; who, after long experience in the manufacture of the apparatus, struggling for a considerable time against those obstacles which naturally impede the introduction of every new invention or application, at last succeeded in gaining the co-operations of an extensive West Indian proprietor at Liverpool, whose attorney on the estate gave every possible facility; it may be considered fortunate, that the attempt met with such valuable co-operation. Thanks are also due to Mr. Thomas Dodson, for his determined perseverance in the erection and completion of the apparatus, and to Mr. Jacob Benson, an English boiler, who has shown considerable practical knowledge, and to whom belongs the credit of being the first to boil the cane juice in vacuo, and produce these desirable results.

I shall offer no further comment before introducing the following able and judicious letter, extracted from the *Guiana Chronicle*, in which are developed the views which led to the introduction of the process, and also the complete success attendant upon the first trials.

From the Guiana Chronicle and Demerara Gazette.

To the Planters of Demerara and Essequibo.

Gentlemen,—The attention which has latterly been excited by the various attempts to improve the manufacture of the staple produce of the colony, whilst it evinces your sense of the importance of the object, and implies a conviction on your part that the manufacture of sugar is susceptible of improvement, also encourages a hope that any communication which may have for its object the accomplishment of so desirable an end, and one so intimately connected with your interests, will, in its turn, meet with its due share of attention.

The respective merits of the several systems which have from time to time been proposed for your adoption, have not only been the subject of much private discussion, but have given rise to some animated discussion in the public prints, in the course of which allusions have been made to the principle of boiling in vacuo.

Several months have elapsed since my arrival in this colony for the express purpose of introducing this scientific system, which, though till now never applied to the original practice of manufacturing sugar from the cane, has, by the advantages resulting from its adoption by the principal refiners in Great Britain, during twenty years' practical operation, acquired the highest reputation. It is the fruit of many scientific experiments and much indefatigable perseverance of a late very eminent chemist; and has received the unqualified approbation of the most eminent of that profession, amongst whom are to be found the names of Sir Humphrey Davy, Drs. Ure, Trail, &c.

Although a long acquaintance with the properties of the vacuum-pan, might have warranted me in soliciting your attention thereto at an earlier period, I considered it not only more respectful to you, but also much more in accordance with the diffidence, which, as a stranger to the profession of a planter, I ought to feel to abstain from so doing, until the applicability of the apparatus to colonial purposes was placed beyond dispute—in other words, until I had completed the erection of an apparatus in the colony. I considered also that by postponing it until then, the subject would be divested of that speculative character, which is always, more or less, attached to new applications; and that instead of having to meet objections, which no doubt would have been raised against the system, whilst its advantages were problematical, I should, upon the successful result of the experiment then making, be enabled to adduce actual results instead of plausible conclusions, and facts instead of reasonings.

The experiment has now been tried, and its effects are equal to our most sanguine expectations. The apparatus has been some weeks in full operation on one of the largest estates in this colony; and its results enable me to offer it to the notice of the sugar planter, as the means of making a superior article, and in a much greater quantity than can be produced by any other process hitherto discovered.

Although it would exceed the limits of this address, to give a detailed description of our apparatus and the process, it may be expected that I should give an outline, and by a few general remarks on the principles upon which this system is founded, point out the connexion between the effects and their causes. It is somewhat remarkable that whilst almost every branch of manufacture has been improved by the advance of science and the general diffusion of scientific knowledge, and its application to practical purposes, that the art of manufacturing sugar should have remained stationary from the time that Bryan Edwards described that process in his History of the West Indies, and that it should be reserved to the planter of the present day to make the attempt to verify his predictions, when he said, "That it was no extravagant hope, that the time would come when the salt of the cane, or what we call sugar, would be made pure, and strike into transparent crystals."

The concentration of the cane-juice on the present mode of making sugar in the boilers, requires a long exposure to the action of the fire, the temperature increasing as the operation advances, until it has acquired its proper grain and consistence, when it may be quoted at 250°.

The length of time required to complete the process varies according to circumstances, and depends much upon the skill with which the boilers are hung, the state of the megass, and the consequent intensity of the heat, &c.

Practical chemists well know how injurious so high a temperature is to the flavour and colour of any delicate extract, its tendency to carbonise being in proportion to its consistence; a desire to counteract which, led to the invention of the vacuum-pan by the late Hon.

Edward Charles Howard, and its application on an extensive scale to the refining of sugar.

The vacuum-pan is a large, strong, copper vessel; its form is elegant and scientific; its parts are manufactured and fitted with so much care and exactness as to exclude the admission of all external air. It is worked by the agency of steam, applied externally between the lower part of the pan, and an outside casing. An air-pump, worked by, and attached to, the steam-engine, is connected by pipes to the upper part of the pan.

The pressure of the atmospheric air on the surface of sugar, or any other liquid, boiling in an open vessel, counteracts the ebullition, and by thus retarding the evaporation, renders either an excessive heat, or a longer exposure to one less intense, unavoidable. The common culinary operations of the kitchen afford us daily proofs of the effects of fire upon animal and vegetable substances, and their tendency to carbonise. Milk, for instance, exposed to a fierce fire, not only contracts colour and a disagreeable taste, but forms a black and adhesive crust on the bottom of the vessel. Meat, fish, eggs, &c., possess this tendency in a greater or less degree; a certain portion of this substance is either entirely destroyed, or undergoes a chemical change, which leaves it little or no identity with the original mass of which it formed a component part.

In the manufacture of sugar in the teache, the destructive effects of excessive heat obtain to an effect beyond what may generally be suspected. It destroys a great proportion of the crystals, or, what is the same, it converts the sirop, which would otherwise crystallize, into molasses, by which the quantity of sugar is very materially diminished, and by the creation of carbon, or colouring matter, deteriorates its quality. By this twofold disadvantage the planter is subjected to a great loss, from which he now possesses the opportunity of relieving himself by the adoption of this system.

The excellence of the principle of boiling in vacuo consists in the exclusion of the atmospheric air, and the consequent removal of its pressure; of being able to perform that operation at from 90° to 100 less heat than is required in an open vessel, at which temperature it cannot possibly sustain any injury in its crystals or its colour.

The crystals, or grain, of the sugar thus manufactured are very large and brilliant. These characteristics give to it a greater superiority over sugar made on the present system. It is also semi-transparent: this proves its purity, or freedom from molasses. The size of the crystals involves a very important consideration as connected with the interests of the planter. It is, I believe, a truth susceptible of mathematical demonstration, that in proportion to the increased size of the grain is the increased weight of the sugar. A piece of candy, when broken to pieces, or in other ways disintegrated, cannot be made to occupy as small a space as before. The greater the number of the fractures, the greater is the number of interstices between them, and consequently the greater room required for their reception; from which it is clear, that any measure of capacity which

contains the least divisions of matter, will contain the greater quantity of weight.

A gallon of sugar of a large grain, and perfectly cured, will outweigh a gallon of sugar equally well cured of small grain. By actual experiments on sugar, made on one estate, four gallons of sugar made in the teache weighed 24lbs.; four gallons made in the vacuum-pan weighed 32lbs.; giving as the result the difference of 8lbs., or 2 lbs. to the gallon, a difference much greater than was anticipated.

The clearing of the liquor from its impurities, previous to being boiled, has been a desideratum in the manufacture of sugar, and many attempts have been made to accomplish so desirable an object, but without success. This operation forms one part of our system, and to it we owe in part the production of so clear a crystal. By attention to the proper consistence, temperature, and previous preparation of the liquor, we have succeeded in this very important department by filtering.

Our system of potting and curing is marked by several important deviations from the usual mode, into which it is not my intention to enter beyond making a few general remarks.

I have before observed that sugar made on this principle exceeds in quantity or weight the sugar made in open vessels (as appeared by experiment) in the proportion of 32lbs. to 24lbs., is an increase of 25 per cent. which I endeavoured to show was attributable to the size of the crystals, and which result corroborates the truth of another observation, viz., that a great proportion of *sirops is converted into molasses by excessive heat.* Now this excess not being required in vacuo, the production of molasses is limited to the proportion which nature has given in the cane, although I am not prepared to state with the confidence and precision which I could wish, what that proportion may bear to the whole saccharine substance; yet it is evident from these data that the operation of curing must be necessarily diminished or assisted in the ratio of the diminished quantity of molasses it is intended to separate. I have also observed that *carbon*, or *colour*, is another effect of the same cause; which being obviated in the improved plan of boiling in vacuo, there exists no necessity to have recourse to those powerful chemical menstrua, which were only calculated to repair an injury sustained in the original process at the expense of quantity. As this injury is proved not to take place in the vacuum pan, the sugar stands in no need of any artificial expedients of this nature.

Having in the course of this letter felt myself warranted in offering the vacuum-pan and accompanying apparatus to the notice of gentlemen connected with sugar estates, and endeavoured to show, by actual results, that the advantages of this system are not chimerical, and by a very imperfect and superficial explanation of the principles which govern its operations, having attempted to convey some general idea of its characteristic features, it only remains for me to inform those gentlemen who may be desirous of further satisfaction on any points connected therewith, with a view of availing them-

selves of its advantages, that as the agent of Messrs. W. Oaks & Son, of London, I shall be happy to afford any additional information.

I am, gentlemen,

Yours very respectfully,

THOMAS DODSON.

Pl. Vreede en Hopp, Demerara, 1st Feb. 1832.

The Editor of the *Guiana Chronicle* notices the foregoing communication in the following remarks:—

"We refer to an article on sugar boiling, which we this day insert. We leave it to experienced planters to decide on the practical advantages of the plan. We always avail ourselves with pleasure of every opportunity of submitting to their judgment any proposed improvement in a process of such vital importance to the interests of the Colonies, where such proposals bear the appearance of being the offspring of science, experience, and practicability."

From the samples which I have seen prepared upon different estates, I have no hesitation in stating, that the great desideratum since the cane has been cultivated has now been accomplished—*the preparation of pure sugar direct from the cane juice.* The sugar is obtained in granular crystals, of four and six-sided prisms, terminated by two and three-sided summits, and they are perfectly transparent. It has a very rich mellifluous taste, unknown to that prepared by any other process; it is a purer sweet than even the best refined, and is in no danger of turning into acid in solution, as are other refined sugars.

On the plantations, where this mode of operation has been introduced, it is proved that an addition of 25 per cent. in quantity is obtained; an addition of from 10*s.* to 12*s.* in price per cwt., has been already received for a considerable quantity which has been introduced into the Liverpool market. The apparatus possesses the power to make double the quantity of sugar in the same space of time as the old method.

The advantages of the present improved process consists principally in effecting the last stages of concentration of the juice at so low a temperature as shall merely evaporate the aqueous part without decomposing any portion of the rest. This method of concentration has for twenty-one years been in successful operation in the principal sugar refineries of Great Britain.

The process of the operation is as follows: the canes are crushed, and the juice is concentrated in the usual way, and all extraneous matters are removed by skimming, &c. until the liquor is of nearly equal gravity, water, and saccharine, which is proved by the saccharometer. It is then received into a cistern, from whence it is admitted into a vessel closed against the atmosphere, called a vacuum-pan, and having a double bottom, in which steam circulates, whilst the upper part communicates with an air pump, which, maintaining a partial vacuum, causes the sugar to boil rapidly at a temperature

incapable of decomposing any part of it, or of effecting any changes in its chemical composition.

When sufficiently concentrated, the sugar is discharged into a receiver, called the heater, which is surrounded by steam. Here it is again heated for a short time to strengthen the granulation; and it is then put into very shallow vessels to drain off any small portion of uncrystallizable sirop which may adhere to the crystals. When drained it is placed in trays, and dried in the sun, or removed to the drying house, which, if heated by steam pipes, the same raw sugar can be pressed direct from the curing pans into the stamped loaves, which there is no doubt will soon form a very available and efficient article of commerce.

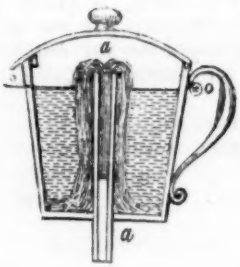
It may be added, that while there is no apparatus to compete with the vacuum principal, there is none so suitable to be put into action, in all climates where the cane is reared, with such beneficial advantages in profit or durability. Its application is particularly adapted for the Mauritius, East Indian, and all foreign sugars, as it possesses a superior advantage in protecting all delicate qualities from decomposition.

On some early occasion I may again trouble your readers with some further observations upon the successive developments and application of the advantages of this system. In the mean time I may mention that samples of the sugar may be seen at the counting house of Messrs. Oaks & Son, 97, Houndsditch, who will communicate any further information upon the subject to any of your readers interested in the inquiry.

London, July 14, 1832.

[The sample of sugar which Mr. Booth has been so good as to send with the preceding very valuable communication, fully bears him out in every thing he has said in its favour. It is left at our office, and may be seen there by any person desirous of examining it.—Ed. Mec. Mag.] [*Mech. Mag.*

¶ *On Oiling Machinery.*



Sir,—there are some remarks in your last number, page 270, taken from the Journal of the Franklin Institute, in which it is stated that oiling of axles continually, so as not to waste a drop of oil, had not been done, till the latest improvement in the friction-saving carriage of the Baltimore rail-road.

This may be true as regards America; but in England that desirable object has been accomplished some time, by the axles of Mr. Collinge, Mr. Mason,

Messrs. Theo. Jones, and some others; in each of which, the continual lubrication of the working parts has been carried to great practical perfection.

With respect to the statements of Mr. M'Ilvaine and George W. Smith, Esq. "that the finest sperm oil most effectually relieves machinery from the effects of friction," I beg leave to add my own humble testimony, as well as the corroborative evidence of several scientific friends, to the correctness of this opinion.

One gentleman, an eminent clock maker, informs me that after a series of well conducted and long continued experiments, he has arrived at the conclusion, that the finest sperm oil, when purified, is the very best that can be used for all kinds of watch and clock work; as well as for every other description of well finished machinery, from the smallest lathe to the largest steam engine.

I must certainly differ from Mr. Rennie, "that the more fluid unguents apply best to light loads." My opinion is, that the finish of the working parts interferes more with the character of the unguent than the mere weight of the load. Thus, for instance, with accurately turned, and highly polished, case hardened axles and collars—such as those of Mr. Theo. Jones & Co.—the fluid unguents are the best, whatever may be the weight of the load. While, on the contrary, axles of less exquisite workmanship, in which the friction is consequently much greater—such as the axles of ordinary carts and coaches—are best lubricated by an unguent of greater consistency, although the load upon them may be lighter than in the former case.

A very beautiful method of lubricating the axles of fixed machinery, was contrived some years ago by Mr. John Barton, and, I believe, included in one of his patents. It consisted of a tin vessel, as delineated in the prefixed figure, having a tube *a*, *a*, passing down through it, and a cover to keep out dust, &c. A number of cotton threads were placed with one end down the tube, the other ends laying over the sides, and descending to the bottom of the vessel. The cup being filled with oil to the line *o o*, and the small tube *a* being inserted in the upper gudgeon of the axle, the cotton fibres become a syphon acting by capillary attraction, which slowly and gradually conveys the oil from the vessel down the tube to the axle to be lubricated.

By increasing or diminishing the quantity of cotton, the flow of oil is regulated to suit the consumption of the machine. In the same way, a gradual supply of *water* may be obtained for any required purpose, such as some grinding processes, the nourishment of delicate plants, &c. &c.

I remain, sir,
Yours, respectfully,
WM. BADDELEY.

July 22, 1832.

[*Ibid.*

¶ *Weight of anchors, and a statement of the dimensions and weights of Chain Cables, &c. used in the British Navy.*

We have thought that a portion of our readers may derive information of a useful kind from the tables which we give below, and which are taken from the United Service Journal for August, 1832.

COM. PUB.

Weight of Anchors supplied to each class of his Majesty's Ships.

	SHIPS.	Bower Anchors.	Stream.	Kedge.
Rate.	Guns.	Cwt.	Cwt.	Cwt.
1st.	Three decked ships from 98 to 120	90 to 95	21	10
2nd	80 and upwards	77 to 80	16	7
3d	70 and less than 80	73 to 76	16	7
4th	50 and less than 70	58 to 68	12	6
5th	38 and less than 50	46 to 50	10	5
6th	24 and less than 26 and 18 gun brigs	20 to 22	8	5

All rates are supplied with four bower anchors, one stream, and one kedge anchor. One of the bowers is technically called the sheet anchor, and another the spare anchor.

Dimensions and Weight of the Chain Cables used on board his Majesty's ships.

RATE.	Inches in diameter.	Equal to hemp cables of	Weight of each chain cable of 100 fathoms in length.
	Inches.	In's. in circumf.	Cwt.
First rate	2 1-8	25 to 23	223
74 to 60 guns	2	22 to 21	200
50 guns	1 7-8	20 to 18½	160
40 to 42	1 3-4	18 to 17½	150
38 guns	1 5-8	17 to 16½	135
28 guns	1 1-2	16 to 15	112½
First rate stream and large sloops	1 3-8	14½ to 14	96
74 guns, stream, and large brigs	1 1-4	13½ to 13	85
Frigates, stream, brigs 10 guns	1 1-8	12½ to 11	64
Stream 600 tons	1	10½ to 10	50
Stream 500 tons	0 7-8	9½ to 9	40
Streams for large brigs	0 3-4	8½ to 7½	30
Small craft	0 11-16	7 to 6½	24
do. do.	0 5-8	6 to 5	20
do. do.	0 1-2	4½ to 4	14

N. B. Each chain consists of eight lengths of twelve and a half fathoms long, united by shackles capable of removal in a moment.

Establishment of Ballast for his Majesty's Ships.

Ships.	Rate.	Proportion.	Remarks.
Ships of 3 decks	1st	1-8th part of their computed tonnage.	Frigates built of fir to have half more than is allowed to those built of oak. Schooners and cutters to have such quantity as may be thought best to suit them. The ballast of ships fitted in wood or cement of twenty-eight guns, having quarter-deck and forecastle, is to be reduced one-fifth of the established quantity, and in flush decked ships and brigs one-third.
do 2 decks	2nd and 3d	1-10th part of their tonnage.	
Large frigates	4th	1-6th do	
Frigates .	34 guns.	1-5th do	
do. .	32 do	do do	
do. .	28 do	do do	
do. .	26 do	do do	
do. .	24 do	do do	
Ship sloops	22 do	do do	
do. .	20 do	do do	
Brigs .	18 do	1-7th do	
do. . .	16 do	do do	

Note.—The iron ballast is cast in bars or pigs, which vary in weight and dimensions as follows:—

						cwt.	qrs.	lbs.
The pigs of	3 ft.	in length by	6 ins.	width and depth,	weigh	2	3	12
,,	1½	,,	6	,,	and 4½ in depth,	1	0	12
,,	1 ft. 5 in.	,,	5½	,,	4½ ,,	1	0	0
,,	1	,,	4½	,,	4½ ,,	0	2	0

Contents, Weight, and Size, of the iron Water Tanks supplied to his Majesty's Ships.

Description of tanks.	Imperial gallons.		Old measure galls.		Weight.			Size.				
	Galls.	Qts.	Galls.	Qts.	cwt.	qrs.	lbs.	Feet	In.	by	Feet	In.
Whole tank.	398	3	478	0	7	0	0	4	0		4	0
Long large half	199	1½	239	0	4	3	0	4	0		2	0
Square half	197	3	238	0	3	2	0	3	2		3	2
Quarter square	98	3	119	0	2	0	24	3	2		1	7
Large bilge	268	0	312	0	5	2	3	4	0		3	8
Small bilge	110	0	132	0	2	2	20	3	2		2	6
do	110	0	132	0	2	2	20	2	6		3	2
Flat half	188	0	218	0	4	0	0	4	0		2	0

N. B. 224 imperial gallons weigh one ton, and one gallon weighs ten pounds.

The number of Sheets of Copper required to copper a Ship of each Class.

No. of guns each class.	100	98	74	64	50	38	36	32	Ships. Sloops.	Brigs. Large.	Brigs. Small.
No. of sheets each ship.	3923	3609	3357	3018	2846	2291	2267	2230	2162	1089	850

It requires about eighty nails to each sheet.

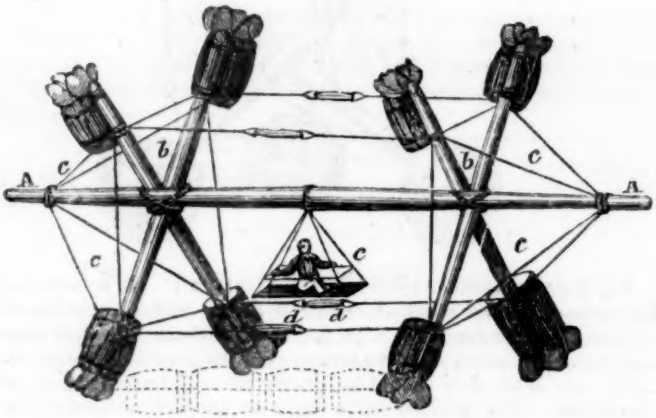
¶ Canning's *Life Raft.*

Sir, it is probable that during the last summer many of your readers may have seen on the river Thames, in the vicinity of New London and Blackfriars bridges, a singular looking machine, composed of spars, and floated by barrels, the object of which was not very apparent.

The machine is, however, one of considerable importance to the maritime world, being a life raft, invented by Mr. Alfred Canning, R. N. for the relief of persons in danger of being shipwrecked; and as a knowledge of its construction cannot be too widely circulated, I submit the following description for insertion in your Magazine.

There are two forms of Mr. Canning's raft, as represented by figs. 1 and 2.

Fig. 1.



In fig. 1, A is a main yard or other spar, with two cross spars *b b* lashed near each end of it, and kept in their places by the ropes or stays *c c*. To give the necessary firmness to the machine, four of the ropes terminate in a loop at *d d*, through which a smaller coil is rove, and braced up *taught*.

The machine is floated by means of empty water casks, one being attached to each end of the cross spars *b b*. The projecting end of each cask is covered with a hammock, to protect them from being stove in by rocks, &c. &c. The number and disposition of the casks, must, of course, be regulated according to the number of persons to be carried. When the number is great it is adviseable to place the barrels as shown by the dotted lines, to obtain sufficient buoyancy. The raft exhibited on the river was so supported.

A platform, *e*, for the reception of passengers, is slung upon the main yard A by a strong loop, so as to turn freely upon it; one or two loops being used, according to the size of platform required. The loops are kept in the middle of the yard by a chock on each side of them.

It will be observed, that only four of the casks can be immersed at one time, and the object of the inventor in using twice that number, is to permit the raft to roll over, without any risk to the parties on the platform *e;* that being suspended as just described, so as to retain a horizontal position whichever set of barrels may be undermost.

Fig. 2.

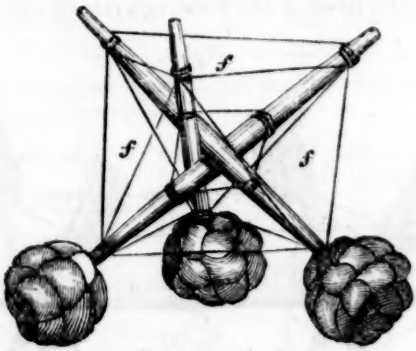


Fig 2 shows another modification of this raft. It is composed of three spars, lashed together crosswise at the middle, and braced up by means of the ropes *f f*. To each end of these spars* is attached an empty cask, or a cork fender, to give the requisite buoyancy. If casks are used, they should be protected with hammocks as before described. The persons upon this raft support themselves in the centre, holding on by the ropes, and shifting themselves whenever the raft rolls over.

It is right to state that the merits of this raft do not rest upon fresh water experiments; Mr. Canning having made numerous trials with it on various parts of the French and English coasts, with invariable success, particularly at Cherbourg and Jersey. At the former place, a raft of the description shown at fig. 1, was drawn out to the head of the jetty in very stormy weather; Mr. Canning having seated himself on the platform, the raft was turned adrift, and was driven by the wind across the mouth of the harbour upon the rocks, and was eventually thrown by the waves, high and dry, upon a shore of the most dangerous character, without any injury either to the machine or to Mr. Canning.

This machine possesses the requisite firmness and stability, with

* For the sake of clearness, only one end so provided is shown in the drawing.

just so much elasticity as is necessary for its safety. It carries the person on it higher, and consequently drier than any other raft, and is perfectly safe and certain on shores where a life boat would inevitably be dashed to pieces. The materials of which it is composed are such as may be found on board almost every ship, and the raft may be put together in a comparatively short period of time.

When a vessel has been wrecked on a lee shore, and a communication formed by means of Captain Manby's apparatus, or the more recent improvements of Mr. Murray, this raft would be found a most eligible mode of landing the crew.

Mr. Canning, some time since, exhibited and explained the construction of his raft, in a lecture delivered to the members of the London Mechanic's Institution, in which he gave an interesting account of several of his experiments in different places; and expressed his readiness to put to sea in the severest storm on any part of the British coast; thereby showing his perfect confidence in the safety and efficiency of his simple life raft.

The Society of Arts have presented Mr. Canning with their large silver medal, as a token of the high opinion they entertain of the ingenuity and utility of his contrivance; and *I guess* it will be some time before they have an opportunity of rewarding another of equal merit.

I remain, sir, yours respectfully,

W. BADDELEY.

London, August 30, 1832. *Mech. Mag*

¶ DR. ARNOTT'S *Hydrostatic Bed for Invalids.*

We are indebted to Dr. Arnott, the author of the above mentioned inestimable invention, for the following account of it, which he has prepared for the fifth edition of his "Elements of Physics," now in the press.

"In many of the diseases which afflict humanity, more than half of the suffering and danger is not really a part of the disease, but the effect or consequence of the confinement to which the patient is subjected. Thus a fracture of the bone of the arm is as serious a local injury as a fracture of one of the bones of the leg; but the former leaves the patient free to go about and amuse himself, or attend to business as he wills, and to eat and drink as usual—in fact, hardly renders him an invalid; while the latter imprisons the patient closely upon his bed, and brings upon him, first, the irksomeness of the unvaried position, and then the pains of the unequal pressures borne by the parts on which the body rests. These, in many cases of confinement, disturb the sleep and the appetite, and excite fever, or such constitutional irritation as much to retard the cure of the original disease, and not unfrequently to produce new and more serious disease. That complete inaction should prove hurtful to the animal system, may by all be at once conceived; the operation of the continued local pressures will be understood from the following state-

ments. The health, and even life, of every part of the animal body depends on the sufficient circulation through it of fresh blood, driven in by the force of the heart. Now when a man is sitting or lying, the parts of his flesh compressed by the weight of the body, do not receive the blood so readily as at other times; and if from any cause the action of his heart has become weak, the interruption will both follow more quickly, and be more complete. A peculiar uneasiness soon arises where the circulation is thus obstructed, impelling the person to change of position; and a healthy person changes as regularly, and with as little reflection, as he winks to wipe and moisten his eyeballs. A person weakened by disease, however, while he genenerally feels the uneasiness sooner, as explained above, and therefore becomes what is called restless, makes the changes with much fatigue; and should the sensations after a time become indistinct, as in the delirium of fever, in palsy, &c.; or should the patient have become too weak to obey the sensation, the compressed parts are kept so long without their natural supply of blood that they loose their vitality, and become what are called sloughs, or mortified parts. These have afterwards to be thrown off if the patient survive, by the process of ulceration, and they leave deep holes, requiring to be filled up by a new flesh during a tedious convalescence. Many a fever, after a favourable crisis, has terminated fatally from this occurrence of sloughing on the back or sacrum; and the same termination is common in lingering consumptions, palsies, spine diseases, &c. and generally in diseases which confine the patients long to bed.

"It was to mitigate all, and entirely to prevent some, of the evils attendant on the necessity of remaining in a reclining posture, that the hydrostatic bed was contrived. It was first used under the following circumstances.

"A lady after her confinement, which occurred prematurely, and when her child had been for some time dead, passed through a combination and succession of low fever, jaundice, and slight phlegmasia dolens of one leg. In her state of extreme depression of strength and of sensibility, she rested too long in one posture, and the parts of the body on which she had rested all suffered; a slough formed on the sacrum, another on the heel; and in the left hip, on which she had lain much, inflammation began, which terminated in abscess. These evils occurred while she was using preparations of bark, and other means to invigorate the circulation, and while her ease and comfort were watched over by the affectionate assiduity of her mother, with numerous attendants. After the occurrence she was placed upon the bed contrived for invalids by Mr. Earle, furnished for this case with pillows of down and of air, of various sizes, and out of its mattress portions were cut opposite to the sloughing parts; and Mr. Earle himself soon afforded his valuable aid. Such, however, was the reduction of the powers of life, that in spite of all endeavours the mischief advanced, and about a week later, during one night, the chief slough on the back was much enlarged, another had formed near it, and a new abscess was produced in the right hip. An air pillow had pressed where the sloughs appeared. The patient

was at that time so weak, that she generally fainted when her wounds were dressed; she was passing days and nights of uninterrupted suffering, and as all known means seemed insufficient to relieve her, her life was in imminent danger.

"Under these circumstances, the idea of the hydrostatic bed occurred to me. Even the pressure of an air pillow had killed her flesh, and it was evident that persons in such a condition could not be saved unless they could be supported without sensible inequality of pressure. I then reflected that the support of water to a floating body is so uniformly diffused, that every thousandth of an inch of the inferior surface, has, as it were, its own separate liquid pillar, and no one part bears the load of its neighbour—that a person resting in a bath is nearly thus supported—that this patient might be laid upon the surface of a bath over which a large sheet of the water-proof India-rubber cloth was previously thrown, she being rendered sufficiently buoyant by a soft mattress placed beneath her—thus would she repose on the face of the water, like a swan on its plumage, without sensible pressure any where, and almost as if the weight of her body were annihilated. The pressure of the atmosphere on our bodies is of fifteen pounds per square inch of its surface, but, because uniformly diffused, is not felt. The pressure of a water bath, of depth to cover the body, is less than half a pound per inch, and is similarly unperceived. A bed, such as then planned, was immediately made. A trough of convenient length and breadth, and a foot deep, was lined with metal to make it water tight; it was about half filled with water, and over it was thrown a sheet of the India-rubber cloth, as large as would be a complete lining to it if empty. Of this sheet the edges, touched with varnish to prevent the water creeping round by capillary attraction, were afterwards secured in a water-tight manner all round to the upper border or top of the trough, shutting in the water as closely as if it had been in bottles, the only entrance left being through an opening at one corner, which could be perfectly closed. Upon this expanded dry sheet a suitable mattress was laid, and constituted a bed ready to receive its pillow and bed clothes, and not distinguishable from a common bed but by its most surpassing softness or yielding. The bed was carried to the patient's house, and she was laid upon it: she was instantly relieved in a remarkable degree; sweet sleep came to her; she awoke refreshed; she passed the next night much better than usual; and on the following day Mr. Earle found that all the sores had assumed a healthy appearance: the healing from that time went on rapidly, and no new sloughs were formed. When the patient was first laid upon the bed, her mother asked her where the down pillows, which she before had used, were to be placed; to which she answered that she knew not, for that she felt no pain to direct; in fact, she needed them no more.

"It may be here recalled to mind, that the human body is nearly of the same specific gravity of water, or of the weight of its bulk of water, and therefore, as is known to swimmers, is just suspended or upheld in water without exertion, when the swimmer rests tranquilly on his back with his face upwards. He then displaces water equal

to his own body in weight as well as in bulk, and is supported as the displaced water would have been. If his body be two and a half cubical feet in bulk (a common size,) he will just displace two and a half cubic feet of water, equal in weight to his body. If, however, instead of displacing the water with his mere body, he chooses to have something around or under him which is bulky with little weight, as the mattress of the bed above described, when his weight has forced two cubical feet of that under the level of the water around, he will float with four-fifths of his body above the level, and will sink much less into his floating mattress than a person sinks in an ordinary feather bed. It thus appears, that by choosing the thickness of the mattress, and if unusual positions are required, by having different thickness in different parts, or by placing a bulk of folded blanket or pillow over or under the mattress in certain situations, any desired position of the body may be easily obtained.

"This bed is a warm bed, owing to water being nearly an absolute non-conductor of heat from above downwards, and owing to its allowing no passage of cold air from below. From this last fact, however, less of the perspiration, whether sensible or insensible, will be carried off by the air than in a common bed, and unless the patient can leave the bed daily to let it be aired, it is necessary to lay an oiled silk, or other water proof cloth over the mattress to prevent the perspiration from descending to be condensed on the cloth below; or to place a blanket below to be changed occasionally; or, finally, to lay under the mattress a layer of cork, cut into small pieces, and so connected as to leave passages between, for any desired degree of ventilation. This bed is, in itself, as dry as a bed can be, for the India-rubber cloth (of which bottles can be made) is quite impermeable to water, and the maker is now preparing cloth expressly for this purpose. Then, as Sir Humphrey Davy recommended that his safety-lamp should be double, some persons may prefer a double sheet to obviate the possibility of accident. Unlike any other bed that ever was contrived, it allows the patient, when capable of only feeble efforts, to change his position, almost like a person swimming, and so to take a degree of exercise, affording the kind of relief which, in constrained positions, is obtained by occasional stretching, or which an invalid seeks by driving out in a soft springed carriage. It exceedingly facilitates turning for the purpose of dressing wounds, for, by raising one side of the mattress, or depressing the other, or merely by the patient's extending a limb to one side, he is gently rolled over, nearly as if he were simply suspended in water; and it is possible even to dress wounds, apply poultices, or place vessels under any part of the body without moving the body at all; for there are some inches of yielding water under the body, and the elastic mattress may, at any part, be pushed down, leaving a vacant space there, without the support being lessened for the other parts.* Then, with all the advantages which other invalid beds possess, and with those which are

* The editor of the Register can add his testimony to the perfect accuracy of this statement, having lain upon one of these hydrostatic beds, and experi-

entirely its own, it may yet be made so cheaply, that even in hospitals, where economy must prevail, it may at once be adopted for the benefit of the bed-ridden. Mr. Earle, within a few days of seeing the first one, had others made for patients in St. Bartholomew's hospital, and has been as much pleased with the results of them as of the first. The bed has since been introduced into St. George's hospital by Mr. Keate, and elsewhere. The author has now seen enough of the effects of this bed, to make him feel it a duty to publish a notice of it. With it, evidently, the fatal termination called sloughing, now so common, in fevers and other diseases, need never occur again. And not only will it prevent that termination, but by alleviating the distress through the earlier stages, it may prevent many cases from even reaching the degree of danger. Then it is peculiarly applicable to cases of fractured bones, and other surgical injuries; to palsies, diseases of the hip joint and spine; and universally where persons are obliged to pass much time in bed. And in all classes of curvature of the spine, either actually existing or threatened, it affords a means of laying a patient in any desired position, and with any degree of pressure incessantly urging any part of the spine back to its place. If used without the mattress it becomes a warm or a cold bath, not allowing the body, however, to be touched by the water; and in India it might be made a cool bed for persons, either sick or sound, during the heats which there prevent sleep and endanger health. There are numerous other professional adaptations and modifications of it which will readily occur to practitioners sufficiently versed in the department of natural philosophy (hydrostatics,) to which it belongs. Before reflection, a person might suppose a resemblance between it and an air bed or pillow, calling this a water bed or pillow, but the principles of the two are perfectly distinct or opposite. An air pillow supports by the *tension of the surface* which encloses the air, and is therefore like a hammock, or the tight sacking under the straw mattress of a common bed, and really is a hard pillow; but in the hydrostatic bed there is no tense surface or web at all: the patient is floating upon the water, on which a loose sheet is laying, merely to keep the mattress dry, and every point of his body is sup-

enced that wonderful ease and softness—that absence from all sensible pressure, and the almost imperceptible effort that is required to move or turn about when upon it. He was permitted to experiment upon the utility and advantages it afforded when upon a recent visit to a near relative, at the admirable establishment for the cure of mental diseases at High Beech, near Woodford, instituted, and constantly superintended by Dr. M. Allen, (author of a valuable book on Insanity, and of various medical, moral, and philosophical works,) and of whose establishment the editor feels it his duty to state, that it consists of two neat and roomy villas, about a quarter of a mile apart, in connexion with sixteen acres of gardens, fields, and pleasure grounds, quite of the Arcadian order: the site is lofty, in a very open part of Epping Forest, and commands very extensive and picturesque views. Here, surrounded by a salubrious atmosphere, with liberty to roam apparently unrestrained, with varied amusements, recreation, or employment provided, and parental care, the unfortunate, but yet comparatively happy, patients, receive all the benefit which it is possible for the most enlightened benevolence to bestow.

ported by the water immediately beneath it. To recall the difference here described, and which is of great importance, the bed is better described by the appellation of *hydrostatic bed* than of *water bed.*

[*Reg. of Arts.*

Detonating Lock.

Mr. N. Waterbury, of 26 Newcastle street, Strand, has invented a new lock on the detonating principle, intended for firing ship's cannon. This machine is comprised in a small brass case, which is readily attached to the priming field, and is fired by a lanyard, in the same manner as practised on board of his Majesty's ships, without interfering with the line of sight. The lever by which the detonating powder is fired, is very powerful, and, as it falls immediately over the touch-hole of the gun, the inventor has given it a slight horizontal motion, by which it slips aside after falling, leaving the vent free to be stopped. One of the principal merits of this invention consists in the application of small paper cases, for containing the detonating powder, and which may be used with the common priming tube, or with powder alone. This lock is applicable to artillery of all descriptions, and should it be contemplated to introduce the detonating principle into the government service, Mr. Waterbury's invention is well worthy of consideration.

[*Lond. Jour.*

The Aracacha.

The *Recueil Industriel* for December, gives the following slight account of the above root, a case of which had become spoiled during its transmission to France.

The aracacha grows naturally in New Grenada, and in other parts of Columbia, where it is known under the name of *Apio*, and is considered as the most useful of all those plants the roots of which are appropriated to the nourishment of man, being superior to the potatoe species. Its flavour is even more agreeable. It is tender and easily cooked, and is found to be so congenial to the stomach, that it is recommended as a food most fitly adapted both to the convalescent and those who digest other aliments with difficulty. This plant, which grows in the countries where the temperature rarely rises above 18 degrees of Reaumur, (60° of Fah.) has for some time past attracted the attention of horticulturalists, both in Europe and in the United States, and trials which have been made with it at Montpellier, Geneva, the horticultural establishment at Fromont, and elsewhere, hold out a prospect that this valuable vegetable may be introduced with success in the southern departments of France. [If so mild a temperature be congenial with its culture, what should prevent its becoming naturalized here?]

At Bogota, where the mean temperature is 18°, a light soil is selected for its cultivation. The roots are planted about fifteen or eigh-

teen inches apart, and when they appear above ground they are treated in the same manner as the potatoe, care being taken to nip off the flowers as they form, which plan is said to concentrate the vigour of the plant in the root, and to increase its bulk, which would not be the case without this precaution. In New Grenada they are six months in coming to perfection.

[*Rep. Pat. Inv.*

New Percussion Gun.

At the Royal Institution, last week, Mr. Farraday produced a new fowling piece, possessing a curious principle of percussion. This gun is the invention of Mr. Wilkinson, conjointly with Mr. Moser, who has obtained a patent for it. The principle consists in the introduction of the priming into the barrel, and firing it in that situation at the *top* of the powder. The priming being fixed in the wadding or shot cartridge, is struck by a fine steel pin, which passes through a sheath or tube, surrounded by the gunpowder; and the advantages are, that no operation of priming is required, that being done in the act of loading; there is no flash or smoke, it is perfectly water-proof, and not liable to miss fire; and the whole charge of powder must be ignited in consequence of being fired from the top, and exactly in the centre.

[*Mech. Mag.*

Extraordinary Rail-way Performances.

On the occasion of a scientific gentleman lately visiting the Liverpool and Manchester rail-way, some very extraordinary performances were effected. On two occasions, a load amounting to one hundred tons was drawn by one engine from Liverpool to Manchester, a distance of above thirty miles, in an hour and a half, being at the average rate of twenty miles an hour. An eight horse wagon on a common road, is capable of carrying only eight tons a day. Consequently, it would take one hundred horses working for one day on a turnpike road to perform the same work as was here accomplished by a single steam engine in an hour and a half on the rail-road. It is said that no further performance on the rail-road had come near this result.

[*Liverpool Paper.*

Experiments upon Milk.

M. Dirchoff, the Russian chemist, who sometime since discovered the process of converting starch into sugar, has lately made several experiments upon milk; the result which he has arrived at is curious. He is said to have found a mode of keeping milk for use for any indefinite space of time. The process of preserving is this—he causes new milk to be evaporated over a slow fire, until it is reduced to a dry powder. This powder is then put into a bottle hermetically sealed. When the milk is wanted for use, it is only necessary to dis-

solve some of the powder in a reasonable quantity of water, and the mixture so dissolved will have all the qualities as well as the taste of milk. [*Rep. Pat. Inv.*

¶ *Symington's Steam-Boat.*

Sir,—The drawing sent herewith represents the *Charlotte Dundas* steam-boat and her machinery, constructed by my father, the late William Symington, Civil engineer.

She was formed for the purpose of towing vessels on the Forth and Clyde canal, and afforded in 1803, satisfactory proofs of her capability by dragging two laden vessels, of seventy tons burthen each, nineteen and a half miles in six hours, against so strong a head wind that no other vessel could proceed that day in the same track.

The late Robert Fulton, the American Engineer, was on board the Charlotte Dundas, took sketches of her machinery, and received ready and explicit answers to the questions he thought proper to put. Several years afterwards his first boat appeared in America.

Prior to the Charlotte Dundas two exemplifications were afforded by my father of the practicability of the adaptation of the power of steam to the purposes of navigation: the first in 1788, on Dalswinton lake, the second in 1789, on the Forth and Clyde canal.

Two circumstances may be worthy of notice—first, the Charlotte Dundas, to prevent accidents, was steered at the stern; second, the idea of making steam subservient to navigation originated from witnessing the performance of a model for a steam carriage, which, in 1784, he had invented, and, in 1786, submitted to the inspection of eminent scientific and learned gentlemen in Edinburgh.

Should these facts be deemed interesting, their insertion in your widely circulated Magazine will oblige

Your most obedient servant,

W. Symington.

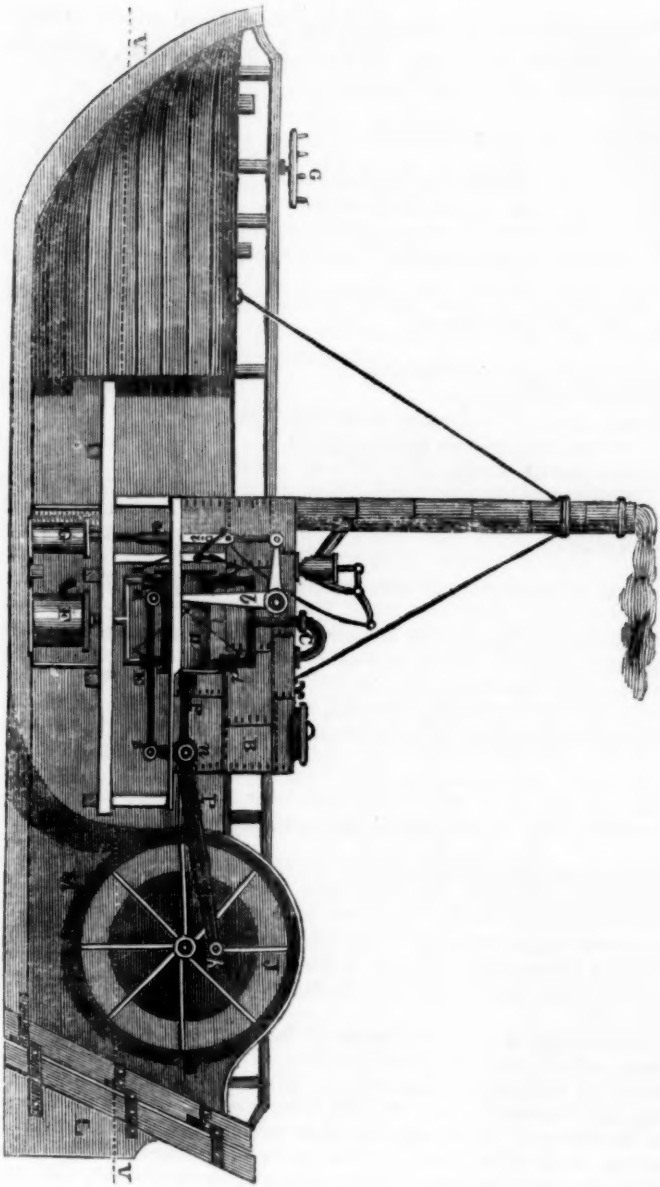
Bromley, Middlesex, Sept. 4, 1832.

Description of the Engraving.

a, cylinder. B, boiler. C, steam pipe. *d*, steam valves. E E, exhausting valves and eduction pipe. F, condenser. G, air pump. *h*, air pump lever. *i*, hand gear and pump rod. J, paddle wheel (1.) *k*, crank. L, starboard rudder (2.) M M, paddle wheel cavity (3) *n*, friction wheels. P P, piston and connecting rods (4.) T, arm and rod (5.) G, steer wheel. V V, flotation line.

[*Mech. Mag.*

(1) Contained in the paddle wheel cavity.
(2) Connected to the larboard rudder by means of iron rods, and wrought in the fore part of the boat by a steer wheel in the centre of the stern of the vessel.
(3) Open behind and below to the water.
(4) Supported by the friction wheels.
(5) Communicating motion to lever.



¶ *Amount of the real or declared value of the different articles of Hardware exported from Great Britain to foreign countries, during the year ending 5th of January*, 1830.

	£	s	d.
Brass and copper manufactures,	810,641	2	0
Hardware and cutlery,	1,389,514	19	0
Iron and steel, wrought and unwrought,	1,155,176	15	0
Mathematical and optical instruments,	21,612	5	7
Plate, plated wares, jewellery, and watches,	177,242	1	0
Tin and pewter wares, exclusive of unwrought tin,	235,021	19	1

The exports of the same articles during the year ending 5th of January, 1820, were as follows—

	£	s	d.
Brass and copper manufactures,	653,859	13	5
Hardware and cutlery,	1,149,510	19	7
Iron and steel, wrought and unwrought, (mathematical instruments not specified,)	924,448	8	1
Tin and pewter wares, (exclusive of unwrought tin,)	187,811	10	7
Total,	2,915,630	11	8
Increase of the exports of 1829 over those of 1819,	873,578	10	0

The United States is by far the most important market for hardware and cutlery. Of the total value (£1,389,514) exported in 1829, they took no less than £669,871. The East Indies, West Indies, British North American colonies, and the United States, are the principal markets for iron and steel.

[*Mech. Mag.*

Armed Steam Vessels.

The large steam vessels which are now in progress of building in Sheerness, Chatham, and Woolwich dock-yards, are to carry two bomb cannons, mounted on pivots, so as to swivel and command an extensive range, without altering the course of the vessel. This will enable a steam vessel to be put in the best possible position, relatively to an enemy's armed vessel, so as to protect the paddle wheels free from shot.

One cannon is to be so situated on the after part of the deck as to range entirely over the arc of the stern, and as far forward as the paddle boxes will permit. The other is to be mounted before the wheels, and will command an arc on each side, from the bow to the forepart of the casing of the wheels; the latter prominence will, however, interrupt much of the service of this piece of ordnance. The calibre of the cannon is ten inches, and it weighs upwards of eighty-four cwt.

[*Ibid.*

New Diving Apparatus.

The Board of Admiralty lately sent down to Sheerness the invention of an ingenious apparatus, to make a trial of, under the inspection of Sir J. Beresford. The diver descends into the water by a ladder, where he can remain for a length of time, and can walk about the "ocean's oozy bed" with perfect safety, and even without feeling any suffocating sensation. The apparatus consists of a metal cap or covering for the head, with two tubes or hoses affixed to it; these lead to an air pump which is kept constantly at work during the descent. Two glasses are fitted in the cap, by which he is enabled to see any thing, and to pick up the smallest article. His dress, including the gloves, is a preparation of Indian rubber; so that he is not exposed to wet or cold; for upon removing the dress and cap, the diver appears perfectly dry and warm.

[*Rep. Pat. Inv.*

Ogle & Summers' New Steam Carriage.

A most satisfactory trial has lately been made of the powers of the steam carriage of these gentlemen. A large wagon was attached to their vehicle, containing a boiler for a ten horse steam engine, weighing, without the wagon, upwards of forty hundred weight. In the steam carriage were about twenty persons, and many on the boiler in the wagon. The roads were very heavy and wet; notwithstanding, so great was its power, that it proceeded with the greatest facility at upwards of ten miles an hour, crossing two bridges at Redbridge, about four miles from Southampton, of the following elevation, nine and three-eighths inches in ten feet! and deposited its immense load at Eling. The fore wheel of the carriage, (as is often the case with new wheels) became bound in the axle, which materially added to the friction, but the whole of the machinery was perfect. It is supposed, that if the full power of the engines were to be exerted, three times the weight could be drawn with equal facility, and greater rapidity.

This experiment is one of great importance, and calls on the proprietors of the newly projected rail-ways to pause before they proceed.

We understand that Messrs. Ogle and Summers made the trial to satisfy themselves, previously to their painting the vehicle, and proceeding through Oxford, Birmingham, Liverpool, and Newcastle-on-Tyne, to Edinburgh, that the power of their patent boiler was more than sufficient for the purpose of merely carrying twenty or thirty persons at fifteen miles an hour. We know, that in a less perfect carriage, they have cleared many miles at the rate of thirty an hour.

[*Ibid.*

Notice to Correspondents.

Mr. Scholfield's letter is received and will be inserted in the next number.

X's query will also have a place.

Will some of our correspondents undertake the review of the *Mechanics* of the *Library of Useful Knowledge, and Cabinet Cyclopedia?* They are less known than their merits deserve.

COM. PUB.

Meteorological Observations for November, 1832.

Moon.	Days.	Therm. Sun-rise.	Therm. 2 P.M.	Barometer. Sun-rise.	Barometer. 2 P.M.	Dew point.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches.	Inches.				Inches.	
☉	1	50°	56°	30.10	30.00	46	SW.	Moderate.		White frost—hazy—rain
	2	47	53	29.83	29.90	41	W. S.	do.		Hazy. [red.
	3	37	55	30.15	30.15	35	W.	do.		Clear—hazy.
	4	37	60	.05	.05	50	S.	do.	.40	Cloudy—rain in night.
	5	55	66	29.90	29.90	57	W.	do.		Flying cl'ds—cloudy: rain
	6	52	49	.80	.80	52	SE. E.	do.	.45	Rain—cloudy.
	7	43	54	.90	.90	48	NW.	do.		Cloudy day.
	8	36	41	30.00	30.00	32	N. NW.	do.		Cloudy day.
	9	31	42	29.90	29.90	26	W.	do.		Clear day.
	10	34	50	.74	.74	31	W.	Blustering.		Lightly cloudy—clear.
	11	36	55	.65	.65	42	SW.	Moderate.		Clear—hazy.
	12	30	54	.80	.80	50	ENE. S.	Calm.		Clear—hazy.
☽	13	38	56	.80	.70	38	W.	Moderate.		Clear—hazy.
	14	36	39	.70	.70	32	W.	Blustering		Clear day.
	15	27	33	30.00	30.00	22	W.	do.		Clear day.
	16	21	40	.20	.20	20	NE. S.	Moderate.		Clear day.
	17	35	50	.20	.20	44	NNE. SE.	do.		Cloudy day.
	18	52	60	29.70	29.70	58	S.	do.		Rain—cloudy.
	19	50	55	.70	.70	65	SW.	do.		Cloudy—flying clouds.
	20	34	37	.60	.60	21	W.	Blustering		Clear day.
	21	28	38	30.15	30.15	27	W.	Moderate.		Clear—cloudy.
⊗	22	34	36	.00	.00	40	N.	do.	1.05	Rainy day.
	23	34	42	29.60	29.60	33	W.	do.		Light clouds—cloudy.
	24	33	42	.70	.70	34	W.	do.		Cloudy—flying clouds.
	25	24	35	30.10	30.10	19	W.	do.		Clear day.
	26	32	56	.05	.05	32	S.	do.		Clear—hazy.
	27	49	56	29.80	29.80	45	SW.	do.		Cloudy—flying clouds.
	28	46	49	.80	.80	42	W.	do.		Lightly cloudy—do.
	29	32	53	.95	.95	36	W.	do.		Clear day.
☽	30	40	54	.90	.90	48	SE. SW.	Calm.		Cloudy day.
	Mean	38.57	49.07	29.89	29.89	36.9		do.	1.90	

	Thermometer.	Barometer.
Maximum height during the month,	66. on 5th.	30. 20 on 16th.
Minimum do.	21. on 16th.	29.60 on 20th. 23d.
Mean do.	43.80	29.89